



Energy Saving Trust Innovation Programme

Breaking New Ground

A project to transfer knowledge about Ground Source Heat Pumps (GSHPs) and accompanying energy efficiency measures between social landlords

Phase 1: Feasibility

Project Partners:

Energy for Sustainable Development Ltd.
Penwith Housing Association
Earth Energy Engineering
GeoScience Ltd.
Linx Homes

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Project details

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|---------------------------|--|
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Partner details

Energy for Sustainable Development is a sustainable energy company specialising in all aspects of energy efficiency, renewable energy technology and climate related policy, with over 50 staff in the UK and overseas. ESD has a wealth of experience in assisting housing associations implement sustainable energy projects, having worked with a large number of housing associations through projects supported by the Housing Corporation & Energy Saving Trust over the last few years.

ESD brought to this project its knowledge of the housing association sector, technical expertise in domestic energy efficiency and renewable energy technologies, and overview of sustainable energy policy and practice.

ESD also brought to the project its contacts with a wide range of housing associations throughout the UK via a number of projects funded by the Housing Corporation's Innovation and Good Practice Programme and the Energy Saving Trust. These include:

- EEC Consortia Network – this was a network of 8 regional consortia of over 150 housing associations that worked together to identify opportunities for funding for energy efficiency improvements through the Energy Efficiency Commitment (EEC).
- Practical Support – this initiative visited and provided support to over 50 housing associations on all aspects of sustainable energy projects.

Penwith Housing Association was formed in 1994, following a large scale voluntary transfer (LSVT) of the entire housing stock (some 3500 dwellings) of Penwith District Council. PHA now has a stock of 3800 homes in Cornwall and a continuing development programme for new homes.

In the first seven years of its existence the Association invested £29 million in capital repairs to its existing housing stock, much of which has been expended on measures designed to combat fuel poverty.

A significant proportion of PHA's stock is off the gas network with many properties having solid fuel heating systems. In general, these were too expensive to run to provide Affordable Warmth and, in addition, many residents were having trouble coping with these systems. This led Penwith HA to investigate alternative heating options such as oil, electric storage heaters or GSHPs.

Penwith HA have been truly innovative in their use of GSHPs in social housing:

- They were the first social landlord in the UK to install them in new homes (4 bungalows at St. Levan Road, Marazion, completed 1998)
- They were the first social landlord in England & Wales to install them in existing properties (14 bungalows at Chy An Gweal, Ludgvan, Cornwall, completed 2004). Penwith HA have recently won 2 awards for this project: the South West Green Energy Award (Best Community Project) and the National Home Improvement Council Award (Innovative approaches to Central Heating and Domestic Hot Water Installations).

Earth Energy Engineering developed a ground source heat pump system especially for installation in social housing. It is this system that has been adopted by Powergen for their 'HeatPlant' programme.

GeoScience Ltd is the UK's longest established specialist Geothermal Energy Consultancy and a leading UK designer and installer of EarthEnergy™ systems. GeoScience have worked with a number of social landlords including:

- Penwith Housing Association
- Metropolitan Housing Trust
- Black Country Housing Association
- New Progress Housing Association

Linx Homes is the largest Registered Social Landlord operating in the Lincolnshire resort coast area with over 5,000 properties following an LSVT in 1999. Properties range from family homes to sheltered accommodation for the elderly or disabled.

With many properties off the mains gas network, Linx are actively investigating alternative sources of heating for their properties. For example,

- Linx Homes have installed solar hot water heating systems in a number of their properties,
- They are about to install biomass boilers in two sites and are considering mini CHP in a number more.

Executive summary

The UK Fuel Poverty Strategy made a commitment to eradicate fuel poverty among vulnerable households by 2010. The problem is of particular concern to RSLs who have the highest concentration of fuel poverty of any sector. In existing stock, the higher running costs of homes that do not have access to mains gas means that there is a clear correlation between householders living in homes without a gas supply and householders living in fuel poverty.

Ground Source Heat Pumps (GSHP), combined with energy efficiency measures, represent one possible solution to the issue. GSHPs can offer lower running costs for space heating and DHW than oil, LPG and electric storage heaters and in addition, have significantly lower CO₂ emissions than some conventional sources of heating.

Despite being a proven and trusted technology on the continent with many thousands of installations, the Ground Source Heat Pump market in the UK is still in its infancy. In particular in the managed housing sector, there are just a handful of installations, despite the potential of this technology to alleviate fuel poverty in homes off the gas network.

From our meetings with Housing Associations prior to the start of this project, some key barriers were identified including a lack of 'real' installations, the high capital cost and lack of knowledge about both the technology and funding opportunities for it.

The aims of this feasibility study therefore were:

- to provide support to Linx Homes (and others) to enable them to make an informed decision whether to install GSHPs in their properties;
- to test the knowledge transfer process between 'expert' and 'developer' social landlords and
- to assess the likely demand for an implementation project from the target audience of social landlords and to determine its format.

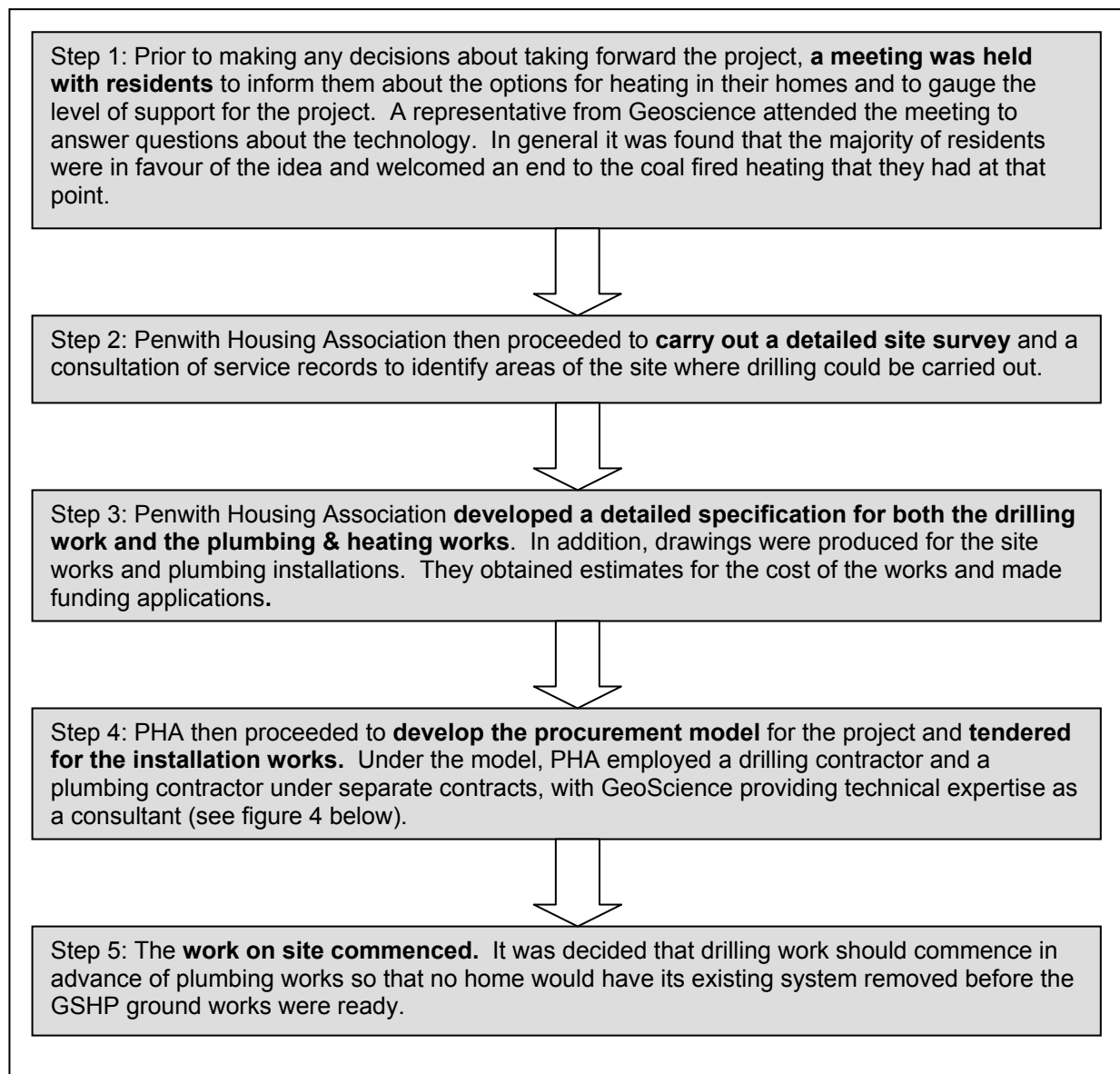
An initial email was sent to RSLs in the ESD contact database asking for them to contact us if they had an interest in GSHPs. There was an excellent response from this confirming ESD's expectation that a number of Housing Associations and Local Authorities are interested in GSHPs and the opportunities presented by this technology.

All those who responded were sent further information about the project and GSHPs and follow-up calls identified a number of RSLs who had potential projects and sites for GSHPs that they were looking to progress. The project aimed to provide support to these social landlords through:

- An Open Day at Penwith Housing Association to enable knowledge to be transferred between social landlords. This was a valuable opportunity for social landlords to:
 - find out more about GSHPs, the cost, funding available and the types of properties they are suitable for,
 - to talk to Denys Stephens who led the work at Penwith HA about his experiences of GSHPs,
 - to talk to residents who live in the properties in which they were installed,
 - to visit the properties where the GSHPs were installed,
 - and to discuss potential sites that they may be considering for GSHPs with experts from Earth Energy Engineering and GeoScience.
- Follow up handholding visits to individual social landlords who had potential sites to provide further information and support to enable them to progress potential projects further (hopefully through an EST funded implementation project).

One of the key issues that social landlords will face when installing GSHPs (and particularly if they are installing GSHPs in existing properties) is to define a model for the installation process. Through this project, a model was drafted for this process, based on the experiences of Penwith Housing Association:

Model for installation of GSHPs in existing dwellings developed by Penwith Housing Association



Finally, the project attempted to estimate the carbon savings possible through the installation of GSHPs and energy efficiency measures. CO₂ savings obviously vary from site to site and to a large extent are dependent on the original heating system in the property. However, data made available through this project suggests that in new build properties CO₂ savings of up to a tonne are possible compared with a comparative gas heating system. For a retrofit situation the potential for savings is much greater, for example, Penwith Housing Association have estimated CO₂ savings of over 3.5 tonnes per property pa for properties where GSHPs replaced an existing coal system.

This project confirmed that a large number of social landlords are interested in GSHP technology and the potential that it offers for homes that are off the gas network but that many lack the confidence to actually install the technology in some of their properties. An implementation project would seek to meet the high demand from social landlords for support and set in place a self-sustaining mechanism of support whereby knowledge is transferred between 'expert' and 'developer' social landlords, leading to a real increase in GSHPs installations in social housing and a corresponding reduction in carbon emissions.

Description of the feasibility study

a) Scope of the study

Despite being a proven and trusted technology on the continent with many tens of thousands of installations, the GSHP market in the UK is still in its infancy. In particular in the managed housing sector, there are just a handful of installations, despite the potential of this technology to alleviate fuel poverty in homes off the gas network.

This feasibility study investigated a possible route to increase the uptake of energy efficiency measures and GSHPs in managed housing. A key element of this was knowledge transfer between 'expert' and 'developer' RSLs - we believe that by giving social landlords the opportunity to talk to another social landlord who has already installed energy efficiency measures and GSHPs and visiting a site to see the technology for themselves, many of the barriers they are facing would be removed.

This feasibility study had 2 elements:

- A practical element – holding an Open Day at Penwith Housing Association and offering handholding support to Linx Homes and others,
- A desk research element – investigating the potential demand and take up for an implementation phase project and drafting a model for the installation process in retrofit situations. The feasibility project also mapped out the format of a possible implementation project.

b) Background

There are approximately 4.5 million households in Great Britain without a gas supply – this equates to approximately 20% of all households¹. Householders living in these homes are forced to rely on oil, solid fuel, LPG or electricity for space and water heating; fuels which are generally more expensive than gas and which also lead to higher CO₂ emissions. In existing stock, the higher running costs of homes heated by oil, LPG and electricity mean that there is a clear correlation between householders living in homes without a gas supply and householders living in fuel poverty¹.

The UK Fuel Poverty Strategy made a commitment to eradicate fuel poverty among vulnerable households by 2010. The problem is of particular concern to RSLs who have the highest concentration of fuel poverty of any sector. Ground Source Heat Pumps, combined with energy efficiency measures, represent one possible solution to the issue. GSHPs can offer lower running costs for space heating and DHW than oil, LPG and electric storage heaters and in addition, have significantly lower CO₂ emissions than some alternative sources of heating.

Despite this, Penwith Housing Association remain the only Housing Association in the UK who have installed energy efficiency measures together with GSHPs in existing stock (only a handful of Housing Associations have installed GSHPs in new build either). Many Housing Associations have expressed an interest in the technology but lack the confidence to install them. From our meetings with Housing Associations prior to the start of this project, some key barriers were identified:

- Lack of 'real' installations. Most people who expressed an interest in the technology have never actually seen a GSHP installed in a property. Nor have they had the opportunity to talk to someone from a RSL who has installed them.
- High capital cost. While lower running costs offer an advantage to tenants and can contribute to an Affordable Warmth Strategy, many social landlords are put off from installing GSHPs and accompanying energy efficiency measures because of high initial costs that will be incurred by the Housing Association. Many social landlords are unaware of the funding opportunities for energy efficiency measures and GSHPs or lack the time or resources to devote to making the funding application.

¹ UK Fuel Poverty Strategy, 2001

- Lack of knowledge. While many in the sector are aware of the technology, many do not have sufficient knowledge of it to make a real comparison between GSHPs and the alternatives. In addition, RSLs generally do not have a good understanding of the issues surrounding the construction regulations during the installation of GSHPs in existing properties.

c) Purpose of study

The purpose of this study was to:

- investigate a possible route to increase the uptake of energy efficiency measures and GSHPs in managed housing,
- provide handholding support and information to a number of managed housing providers who are considering installing GSHPs in some of their properties, to enable them to make an informed decision whether to install the technology or not.

d) Aims & objectives of the study

The aims of this feasibility study were:

- to provide support to Linx Homes (and others) to enable them to make an informed decision whether to install GSHPs in their properties;
- to test the knowledge transfer process between social landlords and
- to assess the likely demand for an implementation project from the target audience of social landlords and to determine its format.

The objectives of the feasibility study were:

- to offer handholding support to Linx Homes (and others) who are considering installing energy efficiency measures and GSHPs in some of their properties. Linx Homes own 28 properties that are off the gas network and are currently occupied by OAPs. They have a number of questions that need to be answered before a decision can be made whether to install heat pumps or not. These include:

- Are GSHPs suitable for these properties e.g. are the gardens big enough to drill the borehole?
- Are GSHPs suitable for elderly residents who have a higher heat demand?
- What energy efficiency measures would need to be installed prior to the GSHP?
- What disruption would there be for residents?
- What would be the approximate cost to the RSL of installing energy efficiency measures and GSHPs?

Other social landlords had similar questions and the handholding support aimed to answer these, such as:

- information on possible sources of funding towards the cost of measures;
- information on energy efficiency measures that should precede the installation of the GSHP,
- an assessment of the suitability of the site and properties for GSHPs. This area of work included a geological assessment of the site to assess its suitability for GSHPs and whether there is sufficient space for the installation. It also involved an assessment of the heat demand of the property (taking into account the energy efficiency measures to be installed) and therefore the size of heat pump needed.

This handholding support enabled the social landlords to make an informed decision whether or not to install GSHPs in their properties.

- to hold an 'Open Day' at Penwith Housing Association for a minimum of 10 people (including Linx Homes) to see existing installations and talk through any issues that were encountered and how they were overcome. This element enabled the knowledge transfer element between expert and developer RSLs to be tested. Penwith HA also offered telephone support on an 'as necessary' basis to ensure that the knowledge transfer continues after the Open Day

- to estimate the potential carbon savings through the installation of energy efficiency measures and GSHPs in RSL properties.

- *to draft a model for the installation of GSHPs in existing stock in managed housing.* Penwith Housing Association was the first English housing association (to our knowledge) to install GSHPs retrospectively. One of the problems that they encountered was how to apply construction regulations (e.g. Health and Safety issues) during the installation process. Penwith Housing Association developed a model to overcome these issues. A key objective of the feasibility study was to define the model as used by Penwith Housing Association. This model can then be refined and disseminated during an implementation project.

- *to demonstrate the demand for the implementation stage of the project via the ESD database of Housing Association contacts.* ESD are currently in contact with almost 300 RSLs through this database and from our work with Housing Associations (principally through the Practical Support and EEC Consortia projects).

- *to determine the form of an implementation stage.* Based on the results of the feasibility project and the response from Housing Association contacts, a plan for an implementation project has been constructed as part of the final report.

- *to keep up to date with developments in other heat pump technologies.* At present, many of these technologies are in the pilot phase. As part of this feasibility study, we kept up to date with developments in this area and the results of these pilot phases. Through this project we also kept up to date with other GSHP developments and projects. This project seeks to complement these other projects and to disseminate information about them, where appropriate.

e) Role of partners in the feasibility study

| Partner Organisation | Their role in the project |
|---|---|
| Penwith Housing Association | Penwith Housing Association was the first social landlord to retrofit GSHPs into existing stock. Through this project, they were keen to transfer the knowledge they have gained and the lessons they have learned to other social landlords. |
| Energy for Sustainable Development Ltd. | ESD managed the project and were responsible for meeting reporting requirements. They used their extensive links with housing associations to identify RSLs who were keen to learn more about GSHP technology. ESD also provided information about energy efficiency measures and funding for GSHPs to RSLs. |
| Earth Energy Engineering | EEE developed a ground source heat pump system especially for installation in social housing. It is this system that has been adopted by Powergen for their 'HeatPlant' programme. EEE were involved in assessing the suitability of potential sites and properties for GSHPs. |
| GeoScience Ltd. | GeoScience Limited is the UK's longest established specialist Geothermal Energy Consultancy and a leading UK designer and installer of EarthEnergy™ systems. GeoScience brought to the project their extensive experience of working with the social housing sector on the installation of GSHPs in new build and existing properties. |
| Linx Homes | Based in Louth, Lincolnshire, Linx Homes is the largest Registered Social Landlord operating in the Lincolnshire resort coast area. With many properties off the mains gas network, Linx are actively investigating alternative sources of heating for these properties. Through this project, Linx have a greater appreciation of GSHP technology and the suitability of the technology for a number of their properties was assessed. |

f) Programme of work/methodology

The work programme was divided into a number of discrete tasks, which are listed in turn below:

| | |
|--------|---|
| Task 1 | Assess level of interest amongst social landlords for GSHPs and the |
|--------|---|

| | |
|--------|--|
| | demand for an implementation phase |
| Task 2 | Handholding support for Linx Homes and others including: a) consideration given to the possible types of energy efficiency measures that should be installed in the property prior to the GSHP b) information on possible sources of funding for GSHPs |
| Task 3 | Open Day at Penwith Housing Association |
| Task 4 | Draft model for installation process based on the experiences of Penwith Housing Association |
| Task 5 | To estimate the potential carbon savings through the installation of energy efficiency measures and GSHPs in RSL properties |
| Task 6 | To keep up to date with developments in other heat pump technologies |
| Task 7 | Write a case study based on the results of the feasibility project |
| Task 8 | Determine form of an Implementation project |

g) Results

Task 1 – Assess level of interest amongst social landlords for GSHPs and the demand for an implementation phase.

This area of work involved contacting RSL contacts on the ESD database to identify those who are interested in GSHPs. The ESD database has been compiled through previous projects with RSLs, part-funded by the Energy Saving Trust. These projects include 'EEC Consortia', 'Practical Support' and 'Condensing Boilers Work!'. The database now consists of contact details for nearly 500 people from over 300 Housing Associations and Local Authorities. The email that was sent is given below:

GSHPs - a solution for homes that are off the gas network?

Dear RSL/ LA contact,

The attached letter has more details about our new project "Breaking New Ground". We believe that Ground Source Heat Pumps (GSHPs) can provide a real solution in a number of circumstances. The project is intended to provide information and assistance to managed housing providers to help them to see where GSHPs will work for them, and to help some organisations to access grants and undertake suitable installations.

If you are interested in GSHPs and want to know more, contact us for more details about this project.

If you have existing properties or new developments that are not on the mains gas network then you should be interested in heat pumps - so contact us!

If you have properties which will fail the Decent Homes Standard because they are not programmable (many solid fuel 'systems') then you should be interested in heat pumps too - contact us!

If you want to have properties which have lower CO₂ emissions - contact us about heat pumps.

Best wishes,

Rachel

Following the initial mail out to all those on the database, 25 social landlords responded expressing an interest in the project and GSHPs. An additional 11 social landlords heard about the project through other routes or had previously expressed an interest in GSHPs to the project team. This excellent response from a single email confirms ESD's expectation that a number of Housing Associations and Local Authorities are interested in GSHPs and the opportunities presented by this technology.

All those who responded expressing an interest in GSHPs and the project were then sent an information sheet, given in Appendix 1. This sheet was designed to give information about the typical costs and benefits from GSHPs, the types of properties that are suitable for GSHPs and details of the support on offer through this project.

All those who responded were then contacted by phone to determine:

- Whether they had specific sites that they were considering for GSHPs and whether these sites were new build or existing properties,
- Or whether their interest in GSHPs is more general at this stage,
- What further information was required by social landlords about GSHPs.

Respondents who were contacted were then grouped into two categories: those with potential sites identified and those who have a general interest in the technology but no specific site identified as yet, see Table 1 below. A full table of social landlord participants is given in Appendix 2.

Table 1- Respondents to initial mail out and follow-up calls by category

| Category | Number |
|--|---------------|
| Potential site identified for GSHPs | 9 |
| General interest only/ need more information before a site can be identified | 20 |
| Not able to contact | 5 |
| Already installed GSHPs | 2 |

Task 2 - Handholding support for Linx Homes and others

All those who had specific sites in mind were offered further support in assessing whether their properties were suitable for GSHPs. An email was sent to respondents detailing the information they would need to provide to the consultant team to enable such an assessment to take place:

If you have got properties that you think might be suitable for GSHPs, now is the time to start collecting information about them. To make an assessment of whether the properties are suitable (whether new build or existing), the project team will need to see:

- For existing properties: photographs of the properties and gardens (to assess whether there is enough room to drill the borehole as well as sufficient access for the drilling machinery) and a site plan if possible, information about the thermal performance of the properties e.g. SAPs, current heating system and fabric of the building

- For new build: site plans and predicted thermal performance

This information can be sent to me and I will pass it on to John Parker of Earth Energy Engineering who is working with Powergen on their Heatplant programme.

Kind regards,
Rachel

Information was received from a number of local authorities (see table 2 below). This was then assessed by the project team to see if the properties were suitable for GSHPs.

Table 2 - Potential sites identified by social landlords for GSHPs

| | | |
|----------------------------------|---------|---|
| Linx Homes | | East View Close, Chapel St Leonards – 28 bungalows currently occupied by OAPs and heated by coal. Access is good as all the properties have large gardens. |
| Nottingham Community Association | Housing | Melton Mowbray, Leicestershire – 9 houses built in the early 1990's currently with electric heating. The properties have small gardens but are arranged in a crescent with an NCHA –owned car park in the middle. |
| Drum Association | Housing | 21 existing properties of a variety of construction types, mainly semi-detached houses and terraces. |
| Signpost Association | Housing | A number of properties that are off the gas network; initially considering trialling GSHPs in 6 properties. |
| Cornwall Housing Association | Rural | Two developments in Cornwall; one of 6 new homes and one of 7 new homes |
| Lincolnshire Housing Association | Rural | A site with 4 new build properties and 2 existing properties |

Following the Open Day at Penwith Housing Association (see task 3 below), follow-up handholding visits took place with:

- Signpost Housing Association
- Drum Housing Association
- Cornwall Rural Housing Association
- Lincolnshire Rural Housing Association

A key part of the handholding support was to give

- a) Consideration to the possible types of energy efficiency measures that should be installed in the properties prior to the GSHP - GSHPs will, in theory, work in all properties. However, to keep the capital costs as low as possible, the heat demand of the property should be reduced as far as is reasonably practical. New build properties are typically suitable as building regulations dictate good thermal performance for new dwellings. In a retrofit situation, typical measures to reduce the heat demand of the property include:
 - Cavity wall insulation
 - Loft insulation
 - Double glazing
 - Draught proofing
 - Solid wall insulation
- b) Information on possible sources of funding for GSHPs - funding for social landlords towards the cost of GSHPs is currently available through the Community stream of the DTI's Clear Skies programme (up to 50% of capital costs up to a maximum of £50,000). In addition, many energy suppliers are showing an interest in offering a discount on the capital cost of GSHPs as part of their Energy Efficiency Commitment programmes. At present only one energy supplier (to our knowledge) has a scheme in place: the Powergen HeatPlant Programme offers a specifically designed GSHP system for social landlords and factors in an EEC discount based on the energy savings received through the installation of the system. In addition, it should not be forgotten that EEC funding is available towards the cost of many of the measures identified in section a) above.

Task 3 – Open Day at Penwith Housing Association

All those who responded to the initial mail out were invited to an Open Day at Penwith Housing Association. The day was to be a valuable opportunity for social landlords to:

- find out more about GSHPs, the cost, funding available and the types of properties they are suitable for,
- to talk to Denys Stephens who led the work at Penwith HA about his experiences of GSHPs,
- to talk to residents who now live in the properties in which they were installed,
- to visit the properties where the GSHPs were installed,
- and to discuss potential sites that they may be considering for GSHPs with experts from Earth Energy Engineering and GeoScience.

The agenda for the day is given in Appendix 3. An invitation to the event was also extended to members of the Cornwall Sustainable Energy Partnership, the Cornwall Energy Efficiency Advice Centre and other local interested parties.

The Open Day was held on 14 April 2005. A total of 19 people attended the event, exceeding the original target of 10 attendees, these people represented 12 organisations.

Table 3 – Attendees at GSHP Day at Penwith Housing Association

| Name | Organisation |
|------------------|------------------------------|
| Colin Arnot | Signpost Housing Association |
| Chris George | Signpost Housing Association |
| Malcolm Farmer | Drum Housing Association |
| Julian Chun | Drum Housing Association |
| Phil Deakin | Linx Homes |
| Peter Moore | Cornwall Rural HA |
| Jon Mutter | Western Challenge HA |
| Simon Waters | Carrick Housing |
| Bernard Morris | Carrick Housing |
| Tony Trolley | Carrick Housing |
| Andy Tanner | Plug into the Sun |
| Janet Lynch | Penwith HA |
| Nanette Newton | Penwith HA |
| Denys Stephens | Penwith HA |
| Robin Curtis | GeoScience |
| John Parker | EEE |
| Jonathan Gibbard | FES/ EST |
| Arnout Andrews | ESD |
| Rachel Child | ESD |

Feedback from attendees was positive, with many social landlords keen to move forward projects to install GSHPs in some of their stock.



Figure 1 - Robin Curtis from GeoScience Ltd. briefs attendees on the drilling process for the ground loop



Figure 2 - Denys Stephens from Penwith Housing Association shows attendees the Chyan Gweal properties and installed GSHP.

Key pieces of information from the day were compiled into a briefing note (see Appendix 4), which was emailed to other social landlords who expressed an interest in GSHPs but were unable to attend the Open Day (34 organisations in total).

Task 4 – Draft model for installation process based on the experiences of Penwith Housing Association

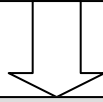
Penwith Housing Association was the first social landlord (to our knowledge) in the UK to install GSHPs in existing dwellings. This unique nature of the project meant that Penwith HA had to identify and overcome a number of issues before the installation could take place, in particular the relationship between different groups of contractors and the Housing Association. The model developed by Penwith Housing Association is presented in figure 3 below. In addition, the following section describes a number of other issues that were considered by Penwith Housing Association before the installation took place:

- Drilling – for example
 - When drilling the borehole, it is important to be aware of the position of underground services e.g. gas and water mains, electricity cables.

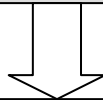
- It is important that the borehole is situated as close as possible to the dwelling whilst avoiding damage to gardens.
- Plumbing – for example
 - The location of the heat pump is important (whether internal or external) and consideration of whether any sound insulation is needed (the heat pump, as with a circulation pump, makes a small amount of noise as it vibrates). Two residents at the Open Day complained of noise from their new heating system but on investigation the noise was originating from the circulation pump rather than the heat pump.
 - The type of heat distribution system is also important. Under-floor heating systems are ideal for GSHPs but are very difficult to install in a retrofit situation. Radiator systems are easier to install in retrofit and the size need not be excessive. High water content radiators are preferable however.
 - A hot water cylinder is supplied with the HeatPlant kit but thought needs to be given as to the location of this and whether a back-up immersion heater is also needed.
 - Control systems – a conventional 2-channel programmer can be used with the system in conjunction with room thermostats and TRVs.
 - Connection to electricity supply.
- Avoiding damage to tenants' gardens (Penwith HA discovered high levels of ground water at the site) by:
 - Covering working areas with waterproof sheeting,
 - Changing specification and depth of boreholes,
 - Changing drilling method.

Figure 3 - Model for installation of GSHPs in existing dwellings developed by Penwith Housing Association

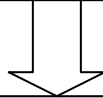
Step 1: Prior to making any decisions about taking forward the project, **a meeting was held with residents** to inform them about the options for heating in their homes and to gauge the level of support for the project. A representative from GeoScience attended the meeting to answer questions about the technology. In general it was found that the majority of residents were in favour of the idea and welcomed an end to the coal fired heating that they had at that point.



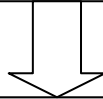
Step 2: Penwith Housing Association then proceeded to **carry out a detailed site survey** and a consultation of service records to identify areas of the site where drilling could be carried out.



Step 3: Penwith Housing Association **developed a detailed specification for both the drilling work and the plumbing & heating works**. In addition, drawings were produced for the site works and plumbing installations. They obtained estimates for the cost of the works and made funding applications.

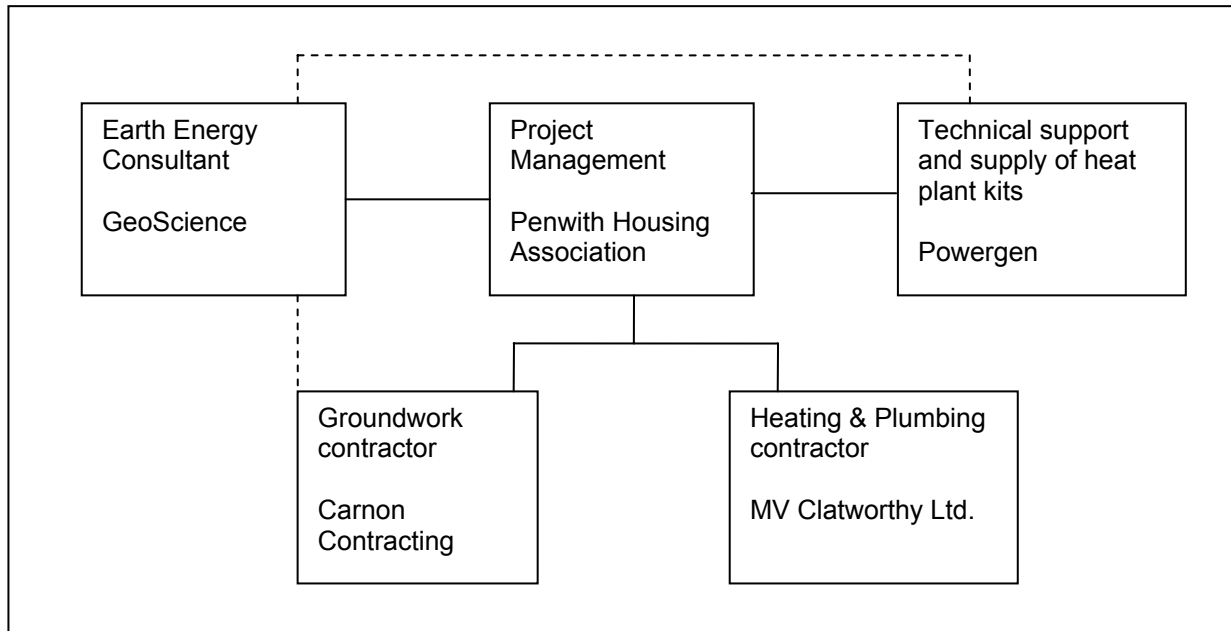


Step 4: PHA then proceeded to **develop the procurement model** for the project and **tendered for the installation works**. Under the model, PHA employed a drilling contractor and a plumbing contractor under separate contracts, with GeoScience providing technical expertise as a consultant (see figure 4 below).



Step 5: The **work on site commenced**. It was decided that drilling work should commence in advance of plumbing works so that no home would have its existing system removed before the GSHP ground works were ready.

Figure 4 - Relationship between contractors and Penwith Housing Association



In a new build situation, many of the issues faced by Penwith Housing Association will not apply. For example, the issue over contracting is much simplified with both the groundwork contractor and the heating & plumbing contractors sub-contracted to the main site contractor. Similarly, the siting of the borehole is easier to determine with a new build site and, in many cases, can be positioned under the planned space for the heat-pump.

During the course of this project, Powergen announced a modification to their HeatPlant² programme, which significantly alters and simplifies the installation process presented in the model above. They are now offering 'kit plus installation' for a fixed price of £4500 (3.5kW) or £5000 (5kW) for a social landlord with a minimum of 6 properties per site. This offer removes a significant amount of risk from the social landlord – one of the problems that Penwith Housing Association faced was escalating installation costs as a result of problems with the borehole drilling. The full implications of this on the model presented in figure 3 above will be investigated in an implementation project.

Task 5 - To estimate the potential carbon savings through the installation of energy efficiency measures and GSHPs in RSL properties

Although carbon savings are important to social landlords, of equal importance are cost savings that tenants can expect from GSHPs compared with an alternative heating system. Achieving affordable warmth and alleviating fuel poverty is a key issue for social landlords especially for vulnerable tenants and those in hard to treat properties. As well as carbon savings therefore, this section gives consideration to costs savings that tenants can expect, initial capital costs and payback periods.

Until recently, there was very little performance data available regarding the potential cost and carbon savings achievable through the installation of a GSHP system. The only published performance data was from a GSHP system in a large, well-insulated private dwelling (Heat pumps in the UK – a monitoring report, GIR 72). However, this was published in 2000 and, given the size of the property that was monitored, is of limited use to social landlords.

² Powergen HeatPlant – Powergen have put together a GSHP 'package' designed for small, well-insulated houses (making it ideal for social housing) as part of their EEC work. The package consists of the kit needed (ground loop, heat pump and hot water cylinder) and is designed to meet all the space heating and hot water needs of the property. It comes in 2 sizes, 3.5kW for £2000 and 5kW for £2500.

This data is presented below however:

Table 4 – Monitoring data from a GSHP system in a large, well-insulated private dwelling

| | |
|---|--|
| Source of data | Heat pumps in the UK – a monitoring report, GIR 72 |
| GSHP system | |
| Energy consumed pa (kWh) | 7,825 |
| CO ₂ emissions pa (tonnes) | 3.6 |
| Capital cost installed | £1,800 |
| Running costs pa | £420 |
| Comparative/ original system | |
| Details | All electric (efficiency 100%) |
| Energy consumed pa (kWh) | 18,680 |
| CO ₂ emissions pa (tonnes) | 8.6 |
| Capital cost installed | n/a |
| Running costs pa | £545 - £1100 |
| CO₂ savings pa (tonnes) | 5 |

Predicted cost and carbon savings were also available from Penwith Housing Association from the installation in new build dwellings in Marazion and in existing dwellings in Chy An Gweal.

Table 5 – Predicted cost and carbon savings from GSHPs installed in Penwith Housing Association properties

| | | |
|---|------------------|----------------------|
| Source of data | Penwith Marazion | Penwith Chy An Gweal |
| GSHP system | | |
| CO ₂ emissions pa (tonnes) | 2.1 | 2.1 |
| Running costs pa | £138 | £139 |
| SAP rating | 83 | 80 |
| Comparative/ original system | | |
| Details | Oil boiler | Solid fuel |
| CO ₂ emissions pa (tonnes) | 2.9 | 5.7 |
| Running costs pa | £169 | £365 |
| SAP rating | 88 | 38 |
| CO₂ savings pa (tonnes) | 0.8 | 3.6 |

Powergen and Earth Energy Engineering calculated typical annual running costs and CO₂ emissions for the Powergen Heat Plant and compared these with running costs and emissions for a variety of other heating systems. The results are shown in table 6 below.

Table 6 – Analysis of annual running costs and CO₂ emissions for a variety of heating systems in a typical small (60m²), well insulated dwelling

| | | |
|--------------------------------------|-------------------------|---|
| Source of data | Powergen | |
| Heating and HW system | Running costs pa | CO₂ Emissions pa (tonnes) |
| Ground source heat pump | £180 | 1.1 |
| Condensing gas boiler | £225 | 2.0 |
| Non-condensing gas boiler | £250 | 2.3 |
| LPG (bottle) (non-condensing) | £500 | 2.9 |
| Oil (28sec) (non-condensing) | £375 | 3.1 |
| Electricity (storage + panels) | £430 | 3.9 |
| Smokeless coal (stove + back boiler) | £710 | 6.8 |

Monitoring data from GSHPs installed in a number of new build bungalows owned by Metropolitan Housing Trust will shortly be available from Powergen and Earth Energy Engineering. To enable comparisons to be made between the GSHPs and alternative heating systems, bungalows in the development were fitted with GSHPs while other identical bungalows in neighbouring developments were fitted with gas condensing boilers.

Task 6 - To keep up to date with developments in other heat pump technologies

In addition to GSHP systems, there is growing interest in other heat pump technologies, in particular air source heat pumps. This technology has recently been added to the eligible technology list under the Scottish Community and Householders Renewables Initiative (SCHRI) although it is not an eligible technology under Clear Skies at present. The capital cost of ASHPs can however be funded under the EST innovation programme. Air Source Heat Pumps are not considered as efficient as GSHPs although they do have certain advantages as there is no need for a ground loop (making them suitable for properties with limited access and outside space) and lower capital costs.

There are a number of trials of ASHPs currently taking place, including:

- A trial of Air Source Heat Pumps is taking place with West Lothian Council in Scotland. The trial is taking place in 2 stages:
 - 1) A simulation analysis of ASHP performance in some typical Scottish dwellings by the Energy Systems Research Unit of the University of Strathclyde.
 - 2) An ASHPs has been installed in an unoccupied dwelling owned by West Lothian Council so that actual performance can be monitored.
- Innovation programme funding was recently awarded to Kirklees, Calderdale and Wakefield LASP and partners for their Helping Air Source Heat Pumps (HASP) project. The aim of the project is to install ASHPs and insulation measures in 31 off mains gas homes, both housing association and private sector. The project aims to demonstrate the effectiveness of the technology for domestic heating and performance of the pumps will be monitored over the next 2 years in conjunction with Leeds University.
- Through this project, we also learned that Carrick Housing in Cornwall are installing five Air Source Heat pumps in properties.

Task 7 - Write a case study based on the results of the feasibility project

A case study has been written and is included in Appendix 5.

a) Key issues and lessons learnt

This section will attempt to determine to what extent the original aims of the project have been met; the extent to which these aims changed over the course of the project and also to identify key issues that have emerged which emerged, which will effect the recommendations for implementation.

(i) To assess the likely demand for an implementation project

The anticipated demand for an implementation project is high. Through this project, a very brief email was sent to those on the ESD database asking individuals to contact the project team if they had an interest in GSHPs. 25 RSLs replied to the email and requested more information. There is clearly a demand from social landlords for more information about alternative heating technologies, the types of properties that they are suitable for, capital costs and running costs and likely CO₂ savings. In particular, social landlords are looking for solutions for homes that are classified as hard to treat, for example those that are off the gas network.

Further, it is likely that many social landlords are not aware that they *should* be interested in GSHPs and the potential that they offer. An implementation project could help to raise awareness of the technology and the possible solution it represents for social landlords with homes that are off the gas network. By publicising the project through routes such as Practical Help, Sustainable Homes and the HECA network as well as EEACs and SHEFs, it is hoped that an implementation project would reach a large number of social housing providers (both Local Authorities and Housing Associations).

For those social landlords who are aware of the technology, making the step to actually installing a GSHP is a big one – many are not aware of suppliers, installers or contractors who have experience in the technology. Many have not ever visited an existing installation or talked to someone from a Housing Association that has installed the technology. Further, many do not have a clear idea of the potential issues that could be involved in such a project.

An implementation project that offered 'handholding' support to social landlords who were considering installing GSHPs to guide them through this process would provide a real route for increasing the number of installations. At the feasibility project stage, we had to limit the amount of handholding support offered to social landlords as there was not sufficient resource available. We anticipate therefore that the demand for an implementation project and the handholding support available would be high.

Further to this, an implementation project would provide an increase in the number of installations in England and would act as a trigger for other social landlords to install GSHPs. The feasibility study showed that social landlords valued being able to see an installation and talk to a managed housing provider who had used the technology. By using the resources available at the implementation stage to enable a number of regional examples of GSHP installations, the project would be creating a resource for other social landlords to use.

(ii) To test the knowledge transfer model between social landlords

A key element of the feasibility project was to enable knowledge to be transferred between 'expert' and 'developer' RSLs. Through the Open Day at Penwith Housing Association, social landlords were given the opportunity to talk to another social landlord who has already installed GSHPs, to visit properties where the technology had been installed and to talk to residents who were living in the properties. The social landlords who attended the Open Day all found this an invaluable experience.

(iii) To provide handholding support to Linx Homes and other to enable them to make an informed decision whether to install GSHPs in their properties

All those who responded to the initial mail out and who indicated that they had actual sites identified were invited to send details of the properties to the project team so that an assessment could be made as to whether they are suitable for GSHPs. A number of social landlords did this (see table 2) and

received follow-up visits from members of the project team to provide them with enough information to decide whether to go ahead or not.

At this point, a number of social housing providers who have received support through this project are planning to install GSHPs.

b) Recommendations for implementation

A full implementation proposal will be submitted in the July 2005 round. However, the broad outline of the implementation proposal is presented below:

- Handholding support for at least 2 social housing landlords as they install GSHPs and energy efficiency measures in a selection of their properties. The two social housing landlord partners have not been confirmed at this stage but possible candidates include Drum Housing Association, Signpost Housing Association, Nottingham Community Housing Association and Carrick Housing. The handholding support could include the following activities:
 - Meeting with tenants to explain the potential new heating system and its advantages,
 - Detailed consideration of energy efficiency measures to be installed in the properties prior to the GSHP,
 - Drawing up a detailed design specification and partnership arrangements with contractors,
 - Monitoring of energy usage prior to and after the installation of the GSHP and accompanying energy efficiency measures.
- Events – a key element of the project will be to disseminate information about GSHPs and the types of properties that they are suitable for to other social housing providers. It is proposed that a series of events will take place around the country to introduce the technology, give details of the type of properties for which they should be considered, typical capital costs, running costs and CO₂ savings. These events can be publicised through established networks such as Practical Help, Sustainable Homes and the EST's EEAC network. In addition, it is proposed that members of the project team should attend and speak at workshops or events organised by other groups, for example SHEF & LASP meetings.
- Production of materials - material will be produced through the project for distribution to social landlords. This will consist of information about GSHPs (including capital costs, running costs and potential CO₂ savings as well as case studies from social housing providers and monitoring information).

c) Conclusions

This project confirmed that a large number of social landlords are interested in GSHP technology and the potential that it offers for homes that are off the gas network but that many lack the confidence to actually install the technology in some of their properties. There are many questions that social landlords have about the technology (e.g. over capital and running costs, suitability of properties, amount of heat delivered etc.) that need to be answered before they could progress with a potential installation.

This project sought to provide general information about the technology to interested social landlords (summarised in appendix 1) and to develop a mechanism through which site-specific questions could be answered and the number of installations of GSHPs in social housing could be increased. This consisted of two main elements:

- Handholding support from experts – to assess the suitability of properties for GSHPs, the size of heat pump needed and the capital cost,
- The opportunity to visit an existing installation and talk to someone from a Housing Association who had installed the technology.

This mechanism was tested through the feasibility project and has been successful in answering the specific questions that social landlords had about the technology and progressing a number of potential

GSHP projects. An implementation project would seek to meet the high demand from social landlords for support and set in place a self-sustaining mechanism of support whereby knowledge is transferred between 'expert' and 'developer' social landlords, leading to a real increase in GSHPs installations in social housing and a corresponding reduction in carbon emissions.

Appendix 1: GSHP and Breaking New Ground factsheet

Welcome to “*Breaking New Ground*”.

Thank you for your interest in our exciting new Heat Pump Project. **We will telephone you next week** (Arnout or Rachel) to talk about what you hope to gain from the project. Perhaps you would just like information, maybe you already have a potential site for installing heat pumps. Within this project we hope to help you make progress with heat pumps, this might require ‘basic’ information or it might be about actually helping you to install some systems?

About this project

‘Breaking New Ground’ aims to let managed housing providers know about the opportunities presented by Ground Source Heat Pumps (GSHPs) particularly for homes that are off the gas network. Energy for Sustainable Development are working with Penwith Housing Association, Linx Homes, Earth Energy Engineering and GeoScience Ltd. on this project which is part funded by the Energy Saving Trust. Through this project we will:

- Hold an ‘Open Day’ at Penwith Housing Association giving managed housing providers the opportunity to see GSHP installations, meet residents & talk to Penwith staff
- Provide information about funding and support available to managed housing providers for GSHPs, for example through Clear Skies and the Powergen Heat Plant programme
- Provide information about which properties are suitable for GSHPs and energy efficiency measures that should be installed prior to the GSHP.

About GSHPs

How much do they cost? And is there any funding available for them?

Typical capital cost for the ground loop and the heat pump should be about £4500 per installation (there will be more details about costs as the project progresses). This does not include the cost of the distribution system (i.e. radiators or under floor heating) which is likely to be an additional £1000. Funding is available through Clear Skies (up to 50% of capital costs) and/ or the Powergen HeatPlant Programme, which factors in an EEC discount based on the energy savings received through the installation of the system.

Can they be installed in all properties?

GSHPs will, in theory, work in all properties. New-build properties (which have a good thermal performance) are typically suitable. In retrofit the numbers only really add up when the heat demand of the property has been reduced down to a practical level (e.g. though insulation). In addition, these properties need to have an accessible area (e.g. garden) for the drilling of boreholes.

What are typical running costs? And can they help to achieve Affordable Warmth?

Performance data from Penwith Housing Association suggests that running costs (space and water heating only) are a little over £200 per annum – significantly less than alternatives such as oil or coal. In this way they can help to achieve affordable warmth for tenants. There is data to suggest that GSHP’s can have lower running costs than gas condensing boilers.

Will they provide all heating and hot water for the property?

The Powergen Heat Plant system is designed to provide all heating and hot water for the property.

Do they save CO₂?

CO₂ savings are achieved even against a gas-condensing boiler. The levels depend on the fuel that is being replaced. However, savings of at least 50% are typical.

What do tenants think of them?

Feedback from tenants is generally positive – see comments from Penwith Housing Association tenants below.

Penwith Housing Association

Penwith Housing Association has pioneered the retrofitting of properties with GSHPs in the UK. They installed GSHPs in 14 bungalows in Ludgvan, Cornwall, replacing the existing coal heating. Funding was received from the Clear Skies programme with additional support from the Powergen HeatPlant scheme. One tenant commented that, “This will mean the end of ash and mess from anthracite and coal. There is only a small disruption to the gardens during the work and considerable CO₂ reduction”.

Further info: Rachel 01225 812 836 Rachel@esd.co.uk or Arnout 07971 512353 Arnout@esd.co.uk

Appendix 2: Mail out responses

| RSL | Email | Follow-up call | Coming to GSHP day? |
|------------------------------|---|--|---------------------|
| Linx Homes | | East View Close Site | REC – yes Phil only |
| Signpost Housing Association | I am interested in looking into the option in greater detail and would be grateful if you could call me to arrange a mutually convenient appointment | Looking at heating options in range of different properties – some off-gas. Going to talk to colleagues about any specific sites. Based in Dorset, quite keen on a trip to Penwith | Yes |
| Cornwall Rural HA | | | AIA - yes |
| Drum HA | Paul Ciniglio and I went to Sweden last Easter to carry out research on GSHP. We certainly have a number of "Off Gas" sites which could be real potentials for such technology. We would certainly be interested in this project. | Spoke to Malcolm Farmer – Swedish technology probably not suitable but still want to do some GSHPs. Probably about 6 to start with but potentially more. | yes |
| Western Challenge HA | I would certainly like more details on heat pumps | Thinking of GSHPs mainly for new build properties and keen to have information about costs etc. No specific sites at the moment. Colleague is attending Penwith Day | REC - yes |
| Carrick Housing | Via Tim at CSEP (and Denys' email). Carrick Housing is Carrick DC's ALMO. They have bid for funding (from EDF?) for 40-50 GSHP systems to be installed in existing properties plus they are looking to do 5 ASHPs. | | yes |
| | | | |
| | | | |
| Amicus Housing Group | Would be interested in some more info, looking to do something next year at four properties that have no mains gas, existing solid fuel, boilers due for upgrade latter in the year. | Properties are concrete construction but have already been externally clad, big gardens. Have loads more properties off gas (100's!) so would be looking to do 4 to start with then possibility of doing lots more. Can't come to Penwith but keen to have follow-up information | REC - no |

| RSL | Email | Follow-up call | Coming to GSHP day? |
|-------------------------------|--|--|---------------------|
| New Progress HA | They might come to Cornwall but they will call us! Adrian will be the main contact when Caeryn moves on. | Installing GSHP in Ribble Valley refurb 13 properties | AIA |
| Places for People | I resent the GSHP open day info – Nick was going to pass it on, unlikely they will come to the event. Thanks for this - Put me on the list | Cambridge site New build, strong drivers to do something so GSHP or dCHP very likely. | AIA |
| Accord Housing Association | Not coming to Cornwall (too far) but keen to be sent follow-up information - please contact him re GSHPs | Retrofit. 30 flats in U-shaped blocks, with inner courtyard. Early on. No gas all electric storage heaters – up for renewal. 2 Storeys. Brick CWI – pitched roof c.1980 Only our e-mails for costs. Got site & flat plans – can do saps. | REC – no |
| | I work for Accord Housing Association Ltd based in West Bromwich, West Midlands. I was wondering if these ground source heat pumps are suitable for 3 storey blocks of flats? At present I have a couple of schemes where space heating is provided through off peak storage heaters. As these heaters are very old and we are constantly replacing them, I would be very interested in an alternative method to providing space heating. | | |
| Cynon Taf Housing Association | I would be interested in receiving more information regarding GSHP's | V. early days – looking at a site for 15 new build properties and want to do something interesting with the heating. On the gas network & nothing likely to happen for a while (buy land after April, start building year after). Not now coming to Penwith (he's on his hols) but still v. interested – potentially a number of sites as they are working on developments with another RSL. Meeting with LA this week to sort out plans for next year. Might send site info for JP... | REC - no |
| Lincolnshire | John H has met JP. Need to call them about | | REC – |

| RSL | Email | Follow-up call | Coming to GSHP day? |
|------------------------------------|---|--|-------------------------|
| Rural | Cornwall. | | eng. 4/4 & 5/5 |
| NCHA | Need to call Mike Price (Andrea can't do the trip) I would be very interested in this project NCHA has : Off gas properties Ex coal board properties still with solid fuel heating A policy to investigate renewable energy options. | Interested in Penwith day – thinking about GSHPs for a number of off gas properties – new build and retrofit. Will get thinking about suitable sites. See email 23/3/05 | REC – eng. 4/4, out 5/5 |
| | | | |
| | | | |
| Moat Housing Group | I am interested in your system please send me details | Retrofit, 300 – 500 off gas, get oil or electric. Oil comparison £4,200. They might be interested in the Cornwall trip – they need more information first. Not coming to Cornwall, too busy. Hasn't really progressed since last call. | REC – no |
| | | | |
| | | | |
| Eastern Valley Housing Association | I am currently working with Charlotte Challis trying to source funding for feasibility study for our flats which currently utilise economy 7 heating which is now 10 to 15 years old. We also have a near 16 year old communal heating system in place at one scheme. We are very interested in utilising sustainable energy solutions. Our development manager would also be interested and our tenants panel. So can we have some more info please? | More of a general interest although he's passed it onto his development team. Most of their properties have access to the gas network. He's going to see if any of the development team want to come to Cornwall | REC - unlikely |
| Orbit group | I am interested in heat pumps as an alternative to electrical heating in rural areas. As always, capital cost has to be a major concern. Having had experience of failed Clear Skies bids and a lot of abortive design of alternative systems as a result, we would want to know that affordability is not | New build, off gas would be the area of interest. Oil comparison is c.£2,500 - £3,000. Examples of real projects and costs. CHP, Whispergen 4 properties PAIN! | REC – DW & GEORGE |

| RSL | Email | Follow-up call | Coming to GSHP day? |
|-----------------------------------|---|---|---------------------|
| | dependant upon uncertain grant income. Some more details would be welcome. | | |
| Broadland Housing | we are interested in this - can you send information to us ? | Lots of off gas, electrically heated properties – lofts and cavities done. Converting some to oil but very interested in GSHPs. Wants to do 1 to start with – but potentially many more after. Not interested in Cornwall trip – too far | |
| Downland Housing Association | I would be interested in being involved/being kept informed about Ground Source Heat Pumps. | General interest – 15% of properties off the gas network plus new build developments in rural off-gas areas. No specific sites yet but interested in being kept informed. Not interested in going to Penwith (too far) – but would be interested in going to see Westlea. | |
| Liverpool Housing Action Trust | Wants further details | General really – not many off gas properties; interested in figures but seems quite expensive | |
| Bromyrdin Housing Association | New build project of 16 bungalows off the gas network. Currently considering oil boilers – mentioned GSHPs and send BNG factsheet. Might be worth chasing... | | ?REC |
| Black Country Housing Association | We are looking into the feasibility of heat pumps for a 125 -home development in South Birmingham. Derek Laurence is the engineer at ARUP who is developing the proposals. Please contact him, if you haven't already. We will be interested in securing Clear Skies funding if heat pumps are shown to be viable. We are in contact with John Parker/Earth Energy Systems who provided advice and equipment for the demonstration heat pump at our Bryce Road development in 2000. Do you feel that you have other things to offer - or just more of the same? | Unlikely to come to Cornwall although could be worth chasing the ARUP guy. Sounded a bit doubtful about the whole development – 'lots of hurdles'. | REC - no |
| Stort Valley/ Anglia | This Association would be interested in looking further into GSHPs. Please can you provide additional information | A/m 28/2/05 | AIA |
| Cantref Housing Association | We are currently looking to undertake a newbuild social housing development in rural West Wales which incorporates and promotes sustainable | Left message 18/2/05, n/a 28/2 | REC |

| RSL | Email | Follow-up call | Coming to GSHP day? |
|-------------------|---|--|---------------------------------------|
| | methods of construction. The basic criteria I have set are that all sustainable elements included in the development must be fully (or partly) grant aidable, provide real benefits to the tenants and the environment and are proven technology (i.e. we would not wish to use 'pilot' technologies which cannot subsequently be replicated in other developments or existing stock.) GSHP's could be one such element. I would be grateful to receive further information regarding GSHP's and any other advice you could give which would assist in achieving our goal in this development and our existing stock. I look forward to hearing from you. | | |
| Swan Housing | Swan Housing are reviewing sustainability options at the moment. Neil would like further info about the project and will take it to the sustainability board to see if they want to pursue further & have any suitable sites. | | REC |
| Octavia Housing | Please can you send me some further information | Large new build programme (600 properties) all in central London so access to mains gas but interested in GSHPs. | REC |
| Brunelcare | Phoned 11/2/05. Lots of sheltered housing – refurb and new build. Interested in sustainable energy stuff and wants more info about GSHPs. At present refurbishing block of 50 flats with a central boiler house – CHP??? | | AIA |
| The Ridings HA | I'd be interested in getting more info on GSHP thanks | a/m 4/4/05, out 5/4/05 | AIA |
| Harrogate Council | Via Denys Stephens. Installing 5 GSHPs plus potentially another 8. Using Ice Energy kit and looking at possibility of Clear Skies or RDA funding. Keen to get more up-to-date performance data than in the BP guide and working at making drilling technology more of a norm. Contact details for Scarborough project – Lance Saxby, | | REC – not coming to Cornwall, too far |

| RSL | Email | Follow-up call | Coming to GSHP day? |
|-----------------------------|---|---|-------------------------|
| | North Yorks LASP (01904 554415). Council has 3500 properties – would like GSHPs the normal option for replacement heating systems. | | |
| Westlea | | Not coming to Cornwall – but would have liked to and is very interested in follow-up information. GSHPs now installed and homes occupied. | REC |
| MHT | | Emailed 5/4 re GSHP day | REC |
| Twynham Housing Association | I am studying in my own time re: housing/energy/environment and am particularly interested in progress in tackling fuel poverty issues - particularly in rural areas where it seems the problems are most keen. Would it be possible for me to access more information about this project, costs, results, what type of dwelling, and what setting, is appropriate, etc. and possibilities for GSHPs to meet needs in hard to heat / off gas network homes. | Nothing more for the moment | |
| Kerrier Homes Trust | Gave John Parker a note in the bar (!) expressing an interest in GSHPs. JP to follow up. | | |
| Rotherham MB Council | Some off gas properties in rural areas. Keep posted. | | |
| Sarsen HA | No immediate sites We are interested in learning more about this project as we have many properties where mains gas is not available. | Interested generally as have lots of off-gas properties with electric heating plus possible new build site in Andover. Possibly interested in Penwith Day | NO AIA |
| Circle 33 | Do want to get any info – especially MHT ‘results’ No immediate sites Don’t want to go to Cornwall Please send me some info. thanks. | | AIA |
| | | | |
| | | | |

Appendix 3: Agenda for GSHP Open Day at Penwith Housing Association

Ground Source Heat Pump Open Day

Ludgvan Community Centre, Chy An Gweal,
Nr Penzance, Cornwall

Thursday 14 April, 2005

| Time | Item | Lead |
|---------------|---|------------------------------|
| 9.30 – 10.00 | Registration & coffee | |
| 10.00 – 10.10 | Welcome, introductions, aims of the day & project | Arnout Andrews (ESD) |
| 10.10 – 10.50 | Powergen HeatPlant <i>(What's been happening, results & the future)</i> | John Parker (EEE) |
| 10.50 – 11.00 | Coffee | |
| 11.00 – 11.30 | Penwith Housing Association experiences <i>(of GSHPs in new build and existing properties)</i> | Denys Stephens (PHA) |
| 11.30 – 12.10 | Installing the ground loop & drilling issues | Robin Curtis (GeoScience) |
| 12.10 – 12.30 | What kinds of properties are suitable for GSHPs? <i>(Conclusions from this morning, energy efficiency & funding opportunities)</i> | Arnout Andrews (ESD) |
| 12.30 – 1.30 | Lunch with the residents | All |
| 1.30 – 3.00 | Issue Clinic - <i>The project partners will be available to answer specific questions relating to GSHPs, the types of properties they can be installed in & funding opportunities. Attendees are invited to bring along site maps, plans and/ or photographs of potential sites.</i> <i>Visit to properties – There will also be the opportunity to visit one of the properties where GSHPs have been installed. We propose splitting into 2 groups for this – one going at 1.30, the other at 2.15.</i> | All |

Appendix 4: GSHP Day follow-up information

GSHP Open Day! Key Information

For those of you that didn't manage to make it down to Cornwall last week, you missed a great day (see below)! There was some really useful information given out which I wanted to pass on to you.

Powergen HeatPlant – Powergen have put together a GSHP 'package' specifically for social housing as part of their EEC work. The package consists of the kit you will need (ground loop, heat pump and hot water cylinder) and is designed to meet all the space heating and hot water needs of the property. It comes in 2 sizes, 3.5kW for £2000 and 5kW for £2500.

STOP PRESS!! Powergen are now offering '**kit plus installation**' for a discounted, fixed price of **£4500 (3.5kW)** or **£5000 (5kW)**. You need to have a minimum of 6 properties per site and the fixed price might not apply for certain sites (e.g. if it is very inaccessible). This price does not include the internals or connection of the hot water cylinder and this discounted price does not apply if you use grant funding (e.g. Clear Skies or SCHRI) towards the cost of the kit or installation.

NB. There are many manufacturers and installers of GSHPs in the UK. However, in our opinion the HeatPlant package represents the best option for social landlords at this time. It is this system that has been installed by Penwith Housing Association and Metropolitan Housing Trust.

Running costs – John Parker has recently completed monitoring work of the GSHPs installed in several new build properties in Nottingham, owned by Metropolitan Housing Trust. This showed that running costs for GSHPs (space heating and hot water) are similar to those for a gas boiler and around half those for traditional electric heating. GSHP running costs are also significantly less than running costs for oil, LPG or solid fuel systems, helping social landlords meet Affordable Warmth targets.



Suitable properties – New build properties that are off the gas network are ideal for GSHPs – they have good thermal performance and if the alternative is an oil or electric system, GSHPs compare favourably in price. In a retrofit situation, again off-gas properties are best (if the property is on the gas network, a gas condensing boiler will be cheaper!). In addition, the properties should be well insulated to ensure the heating load is as small as possible and have an accessible area (e.g. garden) for the drilling of boreholes.

Tenant feedback – the majority of residents we spoke to at the Open Day were very happy with their new heating system and commented that their homes were now much warmer than they had been before when they were heated by coal. In addition, they have lower fuel bills (estimated to be approx. £140 per annum compared to over £350 pa with the coal heating systems). Many residents also commented how much cleaner the new system was compared to the dirt and dust of the old coal system.

The majority of tenants found that the GSHP system met all their heating and hot water needs although one couple found that they did need to use additional plug-in electric heaters in very cold weather. The same couple also complained of the noise with the new system (due to vibration of the heat pump) – other residents did not find this an issue. Finally, residents commented that it is not possible to have the GSHP heating the radiators and the hot water at the same time, although most did not find this a problem.

Appendix 5: Draft Case Study

See separate document