LEAP-FROGGING THE STATUS QUO

Design & Demonstration Unit

First Annual Report

October 2003 - March 2005

The work, views and opinions expressed in this report are those of the DDU, and not of the Department of Trade and Industry or its officials.

DDU Annual Report – Leap Frogging the Status Quo

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Available on the Internet

www.dti.gov.uk/energy/consumers/fuel_poverty/index.shtml

Foreword

This is the first Report of the Design and Demonstration Unit, and covers the period October 2003 to March 2005. The Unit, a team of secondees primarily provided by National Grid Transco, was set up to design, develop and deliver projects in support of Energy White Paper objectives. It has focused on providing adequate, affordable heating to deprived communities, whilst simultaneously meeting other policy objectives. Devising well-researched, well-packaged programmes and projects has been key to its work to date.

The Unit's first eighteen months have been a learning period. Private sector project design and management skills can significantly benefit the public sector, but they can also lead to challenges to established thinking and programmes. The DDU's report makes clear that the customer - and particularly the low-income customer - gains from projects that are properly researched and packaged on a community basis and are economically sustainable. The DDU must be ready to challenge and change established practice - in its words, to leapfrog the status quo.

As well as being a learning period, the DDU's first eighteen months have seen real achievements, which are described in more detail in the annexes to the Report. The DDU has designed and proved its model of delivering gas connections to non-gas communities at much below the usual cost. In the coming year, the DDU intends to move forward on the basis of this experience, not just in providing gas connections, but also in delivering renewables projects to deprived communities. It plans to test the regional approach to delivery through exciting partnership projects with One North-East and Yorkshire Forward, the North-East and Yorkshire and Humberside RDAs.

The analysis in this Report represents the DDU's views. Any comments would be welcome, and should be addressed to Richard Grant at Richard.Grant@dti.gsi.gov.uk

22 July 2005

Executive Summary

This Report sets out the DDU's activities since its establishment, and its proposals for the next year. Detailed descriptions of individual workstreams are included in the annexes to the main Report, which contains a number of findings and solutions:

- there are potentially substantial benefits to Government in using private sector skills to deliver multiple policy objectives through joined-up programmes and projects (section 1)

- the key energy-based measures for removing households from fuel poverty are access to a competitively priced, efficient fuel, the installation of insulation and heating measures and benefits entitlement checks (section 2)

- these measures can be most efficiently and cost-effectively delivered on a community-wide basis. Communities can be selected on the basis of high levels of deprivation, which closely correlates with fuel poverty (section 2)

- communities without mains gas need tailored measures. The DDU's funding and delivery model substantially cuts the cost of providing gas connections to deprived communities, and removing them from fuel poverty. It has already completed five projects, nine others are progressing and ten more are in development. These projects are models for future activity by the DDU and others. Access to more funding sources would enable this work to be rolled out on a larger scale (section 2)

- renewables and other new approaches can be a cost-effective, environmentally sensitive way of delivering affordable warmth to communities that cannot economically be connected to the gas network. In current circumstances, they can be preferable to the installation of oil-fired heating, which carries substantial installation and fuel costs. But, in designing schemes, the whole life costs of projects must be taken into account and distortions created by grant systems discounted (section 3)

- the cost of purchasing and installing renewable technologies is high - markets and supply chains must be developed to drive down costs (section 3)

- delivering programmes regionally provides scope for adding value in a range of ways, including promoting local economic development. The partnership programmes being developed between the DDU and the RDAs in the North-East and Yorkshire and Humberside will test individual project models and regional delivery mechanisms and promote a range of economic activity (section 4)

- the Energy Scenario Assessment is a DDU concept that will provide a holistic approach to new developments, ensuring sustainability is built into projects from the outset (section 6)

- the targeting and integration of existing fuel poverty measures needs to be improved. The "whole house/whole community" approach provides such an improvement and contains many advantages over an individual house approach (section 7)

- there are too few skilled, high quality gas installers, and the labour pool is declining. This raises concerns for the delivery of fuel poverty programmes and appliance safety. The DDU has reviewed the broad background to the problem and made proposals as a basis for discussion. (section 8)

1. Role of the Design & Demonstration Unit (DDU)

1.1 DDU - Introduction

Energy can contribute significantly to the Government's Sustainability Strategy, but it is has proved difficult to find practical, effective, efficient delivery methods because of:

- multi-dimensional objectives – economic, environmental and social;
- complex interplay between different initiatives, programmes and funding sources; and
- diversity and complexity of local circumstances at the numerous points of delivery.

The Energy White Paper recognised that Government has to look at energy policy as a whole, and achieve energy sustainability objectives together, rather than pursuing them as separate streams. This integrated approach to energy policy cuts across traditional departmental boundaries and the Government established the organisational arrangements embodied in the Sustainable Energy Policy Network (SEPN) to effectively work as a virtual organisation across a range of Government departments to co-ordinate the policies and programmes necessary to deliver all the Governments objectives.

The White Paper also recognises the need to utilise industry's enterprise and innovation skills. Within DTI, this resulted in the formation of a small, industry-led, Design and Demonstration Unit (DDU) working in support of SEPN. The DDU was established in October 2003. Its approach is based on the simple premise that Government can deliver on multiple streams of energy policy - social, environmental and economic with single initiatives.

The DDU's main objectives are to utilise private sector skills and thinking to develop, design and demonstrate new, innovative and integrated approaches to sustainable energy management and to bridge the gap between broad policy objectives and conventional national programmes. It demonstrates potential solutions by the effective delivery of solutions capable of adaptation to the diversity to local circumstances.

Since its inception the DDU has identified and evaluated a number of opportunities, developed a number of 'think pieces' and designed a number of pathfinder projects. By implementing and assessing these projects the DDU will demonstrate 'fit for purpose' solutions that can be replicated on a wider scale.

1.2 DDU – Policy Assessment To Date

The Government has a range of social and environmental policy objectives and strategies to address component parts of the energy based sustainability agenda. To deliver progress in these priority areas the Government has tended to develop stand-alone programmes and earmarked considerable funding to tackle issues such as: fuel poverty, urban regeneration, energy efficiency, climate change, air quality, and renewables, often through single-objective-based initiatives operating independently of one another.

The increasing availability of streams of government sponsored activity targeted at component parts of the energy-based sustainability agenda has led to a proliferation of different schemes with different fund aims and objectives and different delivery

organisations utilising different delivery mechanisms. There is some co-ordination between programmes and some relationships have become established, but many organisations work independently towards specific goals without exploiting the considerable opportunities that could accrue from an over-arching sustainability strategy that:

- considers energy policy as a whole and integrates, in a transparent way, the economic, social and environmental objectives and targets;
- maximises the economic, social and environmental efficiencies and effectiveness of the programmes; and
- results in explicit programme direction.

The independent and fragmented nature of the current programmes, which are operated without a robust strategic framework, creates collective inefficiencies, complex institutional arrangements and additional bureaucracy. More significantly, the opportunities to magnify and multiply the returns are missed. There is, therefore, a strong policy and economic argument for, where possible, clustering complementary policy objectives thus reducing costs and delivering multiple outcomes and value streams.

The DDU seeks to champion a more holistic approach to energy and ancillary socio-environmental policy and more effective targeting of funded programmes It can help achieve multiple policy objectives by establishing projects and programmes that cluster the following wider social and environmental benefits.

- Reduce carbon dioxide emissions
- Reduce acidic emissions.
- Achieve UK air quality standards
- Eradicate fuel poverty
- Reduce cost of energy
- Increase thermal comfort
- Reduce natural resource depletion
- Reduce waste
- Promote training and employment
- Promote embedded generation
- Facilitate urban regeneration
- Improve energy efficiency
- Support rural development
- Meet health objectives
- Improve housing stock

1.3 Tackling Energy Based Sustainability Issues More Effectively - The DDU Process

The DDU seeks to address the complex challenge of interrelated energy based sustainability issues by a pattern of provision that meets the following criteria:

- clarity – clear and consistent goals and a defined hierarchy of priorities;
- integration – a holistic approach, with co-ordination and re-focussing of activities where necessary; and
- efficiency – maximum sustainability impact per £ of investment.

In doing so the DDU seeks to utilise business solutions to solve the problems of tackling energy based sustainability issues more effectively. The success and value of the DDU activities will be measured by all outcomes.

More specifically, the purpose of the DDU is to:

- identify opportunities to serve the Sustainability Strategy in the energy field;
- gather detailed information and prepare the scoping analysis to devise carefully-targeted and effective proposals for piloting, and if appropriate, large-scale delivery;
- undertake pilots and rigorously evaluate their effectiveness and scalability and where the pilot is successful; and
- play a central role in developing a plan for the large-scale delivery of the proposal through other agencies and institutional arrangements.

The DDU has adopted a loose process framework for its activities. This process comprises at its simplest level 10 stages:

1. Analyse the status quo.
2. Identify potential synergies between programmes serving the different dimensions of the sustainability agenda.
3. Develop conceptual models that exploit synergies and deliver, or facilitate delivery of, multiple energy policy objectives.
4. Design funding arrangements and secure funds from a range of funding sources.
5. Evaluate business models for small-scale pilot projects and demonstrate relative benefits.
6. Undertake field-trials for screened, potentially viable projects.
7. Demonstrate the effectiveness and efficiencies of the pilot projects.
8. Disseminate information on programmes to central and regional Government, local authorities and other stakeholders.
9. Promote the development of partnerships between public and private organisations to facilitate roll-out of approved programmes.
10. Monitor and review the success of the larger scale programmes and disseminate information.

Although each of these steps are shown sequentially, as in all other aspects of the DDU's work, the stages in the process are not always distinct, many overlap and there is an iterative aspect to the whole approach and essential feedback from one stage to another.

The creation of a 'free- thinking' DDU organisation to support the SEPN work, seeks to add an extra dimension to the current pattern of provision. Like other free–thinking organisations the DDU also raises contentious issues and challenges current thinking and practice.

In analysing the *status quo* and developing a number of concepts the DDU has by necessity explored a number of business solutions and delivery mechanisms that go beyond simply tweaking the framework of the *status quo.* These work streams have generated discussion documents and think pieces with outcomes that aim to leapfrog the *status quo*. Implicit in this work is a focus on developing business and market based solutions that improve efficiency, with the 'whole measured outcome' of any particular activity being shown to be considerably greater than the sum of the parts.

One general feature of the DDU's work, to date, has been a lack of credible information in many fundamental technical areas. Whilst a great deal of information exists, it has been necessary to sift the self-serving, the inaccurate, the anecdotal and imperfect. This

has proved a major challenge, and has in a number of instances required the DDU to undertake focused screening analysis based on first principles. This work has been time consuming and distracting, but has been necessary to ensure that decisions are better informed by more accurate, more objective data.

1.4 Work-Streams

The DDU has engaged in the following major work-streams and these are in various stages of development:

- Gas to non gas communities
- Community renewables
- Regionalisation
- Alternative Heating Options
- Energy Scenario Assessments
- Fuel Poverty improved targeting and integration.
- Energy sector skills

Although each of these work-streams is seen to be distinct they are all interrelated. The risks are that each of these activities is dealt with in isolation. This results in a fragmented approach with the opportunities to exploit the benefits of integrated outputs too easily dismissed. Although significantly more complex it is the DDU's unshakable belief that these issues are best served by a pattern of provision that brings a holistic and 'joined-up' approach to the delivery of key sustainable energy goals.

For ease of reference, each workstream is summarised below. However, in-depth reports can be found in the Annex section at the back of the summary report.

2. Work-Stream 1 – Extending the Mains Gas Network

2.1 Overview

The Mains Gas Extension Working Group report stated that access to cheaper fuels, particularly mains gas, would alleviate some of the problems associated with the poor energy efficiency of the housing stock. And although extending the gas network to everyone would be prohibitively expensive, there is much evidence to suggest that it could prove a financially viable means of significantly improving the living conditions of many.

Since the liberalisation of the gas industry, communities that benefit from extension of the gas network are required to pay the full cost, and therefore, new access to the gas network in the UK has been restricted to new housing developments or more affluent communities. The poorer more deprived communities who would derive the greatest benefit from access to gas are the communities least likely to be able to afford it. These communities continue to be excluded from the substantial economic, environmental, social and health benefits that accrue to communities with access to gas.

2.2 Proposal

The conclusions of the Mains Gas Extension Working Group have been supported by research done for the Fuel Poverty Advisory Group (FPAG) where it has been shown that the most effective measure for taking a household out of fuel poverty is to fit a gas central heating system.

Due to the high capital costs associated with the connection of communities to mains gas, and the fact that the capital costs of connection are spread across those benefiting from a connection, very few established communities have been connected to gas, since privatisation of the gas industry. The DDU undertook the challenge of creating a business model that utilises a market based solution and a range of funding options, that could make a gas connection affordable for a large proportion of homes where it was currently seen as not viable. The developed model would be tested and refined to create a blue print for future mains gas extensions.

2.3 Approach

The DDU undertook to identify five fuel poor communities and to develop a project that would deliver a gas feeder main into the community, gas connection to individual households, high efficiency central heating systems to as many houses as possible, and a package of energy efficiency measures. These communities would form demonstrator projects, to test the model developed. Underpinning research would be undertaken to assess the potential number of communities that the model could be applied to.

2.4 Progress to Date

Desktop analysis undertaken by Transco's Affordable Warmth Programme (AWP) in support of the DDU indicates that there are nearly 9,000 community clusters, of 50 homes or more that do not have access to a gas supply. Of these clusters over 4,600 are within 2kms of a gas main. Indicative costs suggest that with a critical mass of homes, 75%, connecting in year one the communities can be connected for an average of £863 per household.

In the 4,654 clusters within 2kms of the mains it is estimated, using national statistics, that there are some 105,053 households in fuel poverty of these 87,194 are estimated to be vulnerable fuel poor households.

Utilising the project management resources of Transco's AWP, the DDU have developed and refined a community-based model to extend gas to energy poor non-gas communities. Acting as programme managers AWP bring together a number of organisations including – Local Authorities, energy suppliers, gas transporters, network design companies, engineering contractors, central heating suppliers/installers and a range of funding opportunities.

The applied model has allowed each community to be given a 'total solution' package of measures – gas connection, energy efficiency measures, energy advice and highly efficient gas central heating systems. Homes are targeted using a systematic whole-house, whole community approach, similar to that adopted in the Warm Zones model. The success of each project is determined, not only by many organisations working

together in partnership, but also through a critical mass of households connecting in the first year.

The first community to be connected was a 450 home ex-coal mining community in Wrexham, North Wales. By applying this alternative model, the connection costs were reduced to £85 per household, from the £720 originally quoted to the community using the traditional regulated pricing methodology. The Local Authority subsequently offered to pay the £85 so the houses were connected at nil cost.

The DDU originally committed to undertake five pilots to prove the model. These projects are now complete, providing over 1,000 households with a more efficient heating system. A further nine communities are at various stages of development and a further ten projects are being evaluated.

2.5. Future Potential

The DDU continues to work with others to identify funding streams that would enable a large-scale programme to be undertaken. Similarly it continues to work with other utility companies to assess the potential for multi-utility working to further reduce the capital costs of installation.

2.6 Next Steps

Projects in various stages of completion will continue to completion and the results of these demonstrator projects will be published.

Further information and work being undertaken by the DDU in this area is available in Annex 1, Section 1 of this report.

3. Work-Stream 2 – Community Renewables

3.1 Overview

The majority of DDU's community work to date, has tested and proven funding and delivery models for aiding deprived communities that could be connected to the gas network at reasonable cost. The work has shown the importance and suitability of the 'whole community, whole house' approach, under which communities are tackled as a whole rather than an activity being focussed on individual households. It has also confirmed the close correlation between deprivation and fuel poverty, which assists in targeting both DDU projects and other energy-related activities.

It is accepted that extending the gas network to everyone would be prohibitively expensive and therefore the DDU is currently evaluating the effectiveness and financial viability of community based renewable energy sources as a means of reducing atmospheric emissions, eradicating fuel poverty and significantly improving the living conditions of many: - most notably those in rural communities.

3.2 Proposal

Research has indicated that of the 9,000 communities not connected to the gas network over 4,300 are outside the economic range of a gas main. The introduction of community based renewable systems to these unconnected communities has the potential to offer considerable economic, social and environmental benefits.

Renewable technology deployed at the community level is a relatively unexplored option to provide cheap, sustainable forms of energy. A proposal has, therefore, been developed to evaluate the efficiency and cost effectiveness of a range of renewable fuels and technologies that can be deployed in targeted communities. The DDU has agreed to design, develop and demonstrate the potential viability in five community based pathfinder projects.

3.3 Approach

It is intended that the five pathfinder projects will be undertaken each with their own designed business models and each utilising a range of funding options. The projects will be thoroughly evaluated from an internal and external cost and benefit perspective and the capacity to replicate these schemes to other communities will be assessed.

The principal objective of the pathfinder projects is to prove the viability of the technology and to facilitate the development of a new market based programme for renewable technologies allowing them to play a more substantial role in assisting the Government meet a number of stated environmental and social policy objectives and targets in the domestic sector.

3.4 Progress to Date

Working with a range of partners a number of projects have been evaluated. These projects include a mix of renewable energy sources and technologies including biomass, wind, heat pumps, photovoltaics (PV), landfill gas and bio-oil.

Case studies include:

- a localised generation station from PV mounted on a cluster of 7 tower blocks in Redcar and Cleveland;
- a community wind turbine supported by Ground Source Heat Pumps (GSHP), Air Source Heat Pumps (ASHP), and storage heaters, to a 112 home community in Bishop Auckland; and
- a community biomass district heating scheme to a 56 home community in Calderdale, primarily consisting of hard to treat solid walled homes.

3.5 Future Potential

The development of community-based projects will inform future thinking on the cost effective deployment of these technologies and inform debate and policy decisions, and in some cases form a blue print for the development of community-based renewables. Additional projects will be evaluated and if appropriate undertaken to assess other forms of renewable fuels technologies and the results will be published as they become available.

3.6 Next Steps

Work to date has highlighted that because of the small numbers of renewable technologies installed in the UK, the efficiencies associated with scaling-up activities have not been fully evaluated. In addition, the existing grant regime has the effect of distorting the market, targeting the fuel rich and supplementing high profile technologies to the possible detriment of the more cost effective.

Taking these issues into consideration the DDU is undertaking a review to identify what changes are required to make progress in the community renewables arena. The DDU for funding and resource efficiency reasons has chosen to advance the community renewable pathfinder projects through the implementation of work-stream 3.

Further information and work being undertaken by the DDU in this area is available in Annex 1, Section 2 of this report. Other related work-streams include Alternative Heating Options and Regionalisation.

4. Work-Stream 3 - Regionalisation

4.1 Overview

The Energy White Paper proposes that, "In future there will be greater emphasis on local and regional approaches in delivering our energy objectives" and goes on to specify a number of related commitments including:

- building on the existing work with local and regional bodies to develop a new package of measures to promote national objectives through local and regional decision-making; and
- taking steps to ensure a strategic approach to energy is developed and implemented in each region.

It is, therefore, timely for the DDU to re-evaluate the opportunities presented by a more regionally based approach to the delivery of the established national programmes to address domestic energy efficiency and fuel poverty.

4.2 Proposal

The DDU believes that eradicating of fuel poverty and improving domestic energy efficiency requires good complementary supply and demand side management. By establishing a regional delivery mechanism, based on Government office areas the demand and supply can be matched in all their local complexity and diversity.

The Regionalisation Work stream brings together a number of the work streams – gas-to non-gas, community renewables and alternative heating options – and channels some of this activity towards a specific geographical location to help deliver real change on the ground, reflecting the needs of the different communities. By establishing a regional delivery framework that facilitates the integration of the range of funding options available there is the opportunity to put in place more effective real and virtual local and

regional arrangements for eradicating fuel poverty, deploying renewables and improving domestic energy efficiency in a focused and systematic manner.
The DDU, working in conjunction with ONE, the North-East Regional Development Agency (RDA) is developing a project to deliver an integrated, community-based energy programme to deprived communities in the North East of England.

4.3 Approach

The project aims to deliver community-based renewable projects and mains gas connections to deprived communities, together with a package of cost effective domestic energy efficiency and fuel poverty measures. The project will be based on:

- a whole community, whole house package of affordable warmth measures;
- provision of gas connection, where viable, and high efficiency gas condensing boiler for communities off the mains gas network; and
- provision of renewable energy and/or associated technologies where gas is not a viable option.

The project will initially operate for a two-year pilot phase from September 2005. During this phase the aim is to establish funding of at least £8 million and assist twenty rural and urban communities comprising of 50 or more homes and with a Multiple Deprivation Index (MDI) of 25 or above.

4.4 Progress to Date

The DDU and ONE have developed a detailed business plan and the DDU is currently evaluating suitable fast track community projects, based on experience gained in Work-Streams 1 and 2 – Gas-to-Non Gas, and Community Renewables: - which have already identified some qualifying communities and technologies with current projects in various stages of design. All lessons learnt on Work Streams 1 and 2 will be integrated within the organisation.

4.5 Future Potential

The DDU has developed a delivery model with the potential to be replicated across Great Britain. To gain a better understanding of the effectiveness and efficiencies of the proposed organisational arrangements, a further pilot is being developed in Yorkshire and Humberside with Yorkshire Forward. The DDU believe that, by operating in contiguous regions it can exploit additional economies of scale.

4.6 Next Steps

The project in the North East will shortly receive approval and the DDU plans a launch in September. The second pilot in Yorkshire and the Humber will follow shortly afterwards. Monitoring will take place of all communities that fall within the pilot, and case studies will be developed and published.

Further information and work being undertaken by the DDU in this area is available in Annex 1, Section 3 of this report. Other related work-streams include Alternative Heating Options, Gas to Non Gas, and Community Renewables.

5. Work-Stream 4 – Alternative Heating Options

5.1 Overview

The DDU, supported by Transco's AWP, continues to conduct research hard to treat homes and the potential technology and fuel options available to the fuel poor living in this category of housing.

This research has focused on particular house types and a number of technologies, and the DDU has undertaken additional research into oil central heating systems.

5.2 Proposal

The DDU undertook to carry out research into household running costs for hard to treat homes, to include technology efficiencies, fuel usage, and running and equipment costs.

The objective was to arrive at a position by which individuals and housing providers could make informed choices in terms of the capital and revenue costs of differing technologies for different housing tenure.

5.3 Approach

A framework has been developed to assess individual homes, communities and flatted properties. A number of scenarios has been developed to include household installation and running costs for a number of different fuels, technologies, efficiencies and insulation measures. The work has involved an evaluation of:

- the capital costs of equipment;
- the revenue cost of technology and fuels;
- the volatility of fuel prices, both seasonal and annual and the potential cost implications for consumers;
- the emissions associated with different boiler types and fuels; and
- the monetised environmental costs of the different fuels used in different boilers.

Research in these areas has proved difficult given the high level of conflicting information available.

5.4 Progress to Date

A number of research activities have been undertaken. Some of the conclusions to date include:

- multi storey properties can be best served by gas based or biomass combined heat and power or community heating systems;
- individual homes are best suited to gas condensing boilers and energy efficiency measures;
- oil condensing systems offer opportunities where gas is not available, but oil combustion produces much more CO_2 per equivalent unit of heat produced, more price volatility in fuel prices, fewer payment options and higher capital costs; and

- Ground Source and Air Source Heat Pumps can provide a viable alternative for some house types.

5.5 Future Potential

Work continues to be refined on an iterative basis and other studies will be undertaken as appropriate.

To supplement this research, a number of projects are being developed and facilitated, and will provide real time data on which future decisions can be made. Activities under various stages of development include the installation of:

- an ASHP in a tower block in Newham;
- 31 ASHPs in Calderdale, West Yorkshire and 5 in Cornwall.
- a 12kW ASHP installation in a hard to treat solid stone walled 3 bed detached property in Neath Port Talbot;
- mains gas and condensing boilers to some 20+ communities throughout the UK; and
- a district heating system to a flatted development in Redcar.

5.6 Next Steps

Further case studies will be developed through the DDU's Regionalisation programme. Further information and work on Alternative Heating Options and the DDU's Regionalisation programme is available in Annex 1, Section 4 of this report.

6. Work-Stream 5 – Energy Scenario Assessments

6.1 Overview

The development of an effective programme of sustainable energy management should ensure that all energy-based activities that have significant social, environmental and/or economic implications are identified and evaluated.

Government adopts a rigorous preventative approach to environmental management and requires, as a pre-requisite, detailed information on the environmental implications of environmentally significant projects and activities. The DDU believes that energy issues should be firmly integrated into development planning and balanced within the whole decision-making process. The DDU, however, in evaluating *Environmental Assessments* for new community development and proposals for regeneration projects is not convinced that the same rigour is consistently applied to the social, environmental and/or economic aspects of energy provision and use and more significantly to the evaluation of options or alternatives.

6.2 Proposal

The DDU is, therefore, seeking to develop a new approach to evaluating the energy implications of developments. Its approach with the working title "Energy Scenario Assessment" (ESA) advocates a move away from prescription that simply reinforces the *status quo* to a technique that is characterised by flexibility in content, applicability and

methods, and a mutual recognition by developers and authorities of the inherent value of such an approach.

6.3 Approach

The ESA will be a systematic process providing a framework for gathering and documenting information and views about the energy options and the social, environmental and economic consequences of different options for a defined community.

It will recognise the value of assessing the life-cycle sustainability implications of a range of fuels, energy and technology options.

6.4 Progress to Date

A working document and definition of ESA has been developed. For the purpose of the working document the DDU has defined ESA as:

"A systematic process which provides a framework for gathering and documenting information and views regarding the energy options for a defined community and their social, environmental and economic consequences"

This working draft document has formed the basis of discussions with various stakeholders prior to this approach being evaluated.

6.5 Future Potential

The ESA, once developed could be a valuable tool:

- in the design of new communities;
- in the evaluation of options for established communities during regeneration or housing renewal activities;
- to address integrated opportunities for expanding communities; and
- evaluating the cost effectiveness of a range of retrofit solutions for established communities.

6.6 Next Steps

The DDU is currently completing its design of the approach and will seek an appropriate development to act as a demonstrator early 2006.

Further information and work being undertaken by the DDU in this area is available in Annex 1, Section 5 of this report.

7. Work-Stream 6 – Fuel Poverty: Improved Targeting & Integration

7.1 Overview

The DDU sees finding and targeting the fuel poor as the single most difficult step to eradicating fuel poverty. Existing schemes either provide measures to those who are not in fuel poverty, or, for various reasons exclude those that are in fuel poverty. The National Audit Office (NAO) report (June 2003) on Warm Front found that "around a third of fuel poor may be ineligible and two thirds of eligible households may not be fuel poor".

7.2 Proposal

To evaluate the work carried out by the NAO, and using the preliminary Stockton Warm Zone data as a comparison, the DDU carried out sample research and analysis.

7.3 Approach

The DDU's research primarily drew on the experience of the AWP's managed Stockton Warm Zone, which was the most effective of the first tranche of Zones. The research also considered the way in which resources are secured and targeted, and how they interact with 'mainstream' fuel poverty programmes.

7.4 Progress to Date

In early-2004, the DDU produced a think piece that challenged the conventional approach to delivering EEC and Warm Front. It outlined a radical new integrated model and highlighted the potential cost-effectiveness of a regional delivery model that both targets the areas where the fuel poor may be clustered and looks at the impact of integrating European, national, regional and local funding sources.

The paper was produced following the results of the analysis of data from the Stockton Warm Zone. A sample of some 8,500 fuel poor households, showed NAO's figures to have been an underestimate. The analysis showed that 60% of the fuel poor in Stockton did not qualify for Warm Front, and of those eligible for Warm Front 75% were not fuel poor.

7.5 Future Potential

The Stockton Warm Zone experience suggests that comprehensive street-by-street, assessment, survey and treatment can provide a very efficient, cost-effective means of identifying the fuel poor, including the significant number that do not qualify for 'mainstream' grants.

The research also concluded that wards with a high IMD score had a very high proportion of the fuel poor – wards with an IMD of 23.2 or above had 87% of the fuel poor. If the location of the fuel poor is typical, it indicates that some 80%+ of the fuel poor can be found in wards with an IMD of 25 or above.

In the light of this research the DDU will continue to support the development of a more systematic, more targeted approach to finding and eradicating fuel poverty. All the DDU's projects will apply and continue to refine these delivery concepts.

7.6 Next Steps

The DDU recognises that refocusing Warm Front towards supporting a systematic localised approach is not without its problems. The DDU will, therefore, continue to develop its thinking in this area.

Further information and work being undertaken by the DDU in this area is available in Annex 1, Section 6 of this report.

8. Work-Stream 7 – Energy Sector Skills (Gas Installers)

8.1 Overview

Since the privatisation gas industry, there has been a significant reduction in the number of gas installers trained, and a decline in the numbers operating in the sector. This has obvious implications for the market, in terms of price levels and skills availability. It has implications both for the Government's fuel poverty strategy and for appliance safety.

There is no one body or combination of bodies with the strategic overview and the policy and financial weight to resolve the problem. Whilst there has been much discussion about solutions, there has not been a focused, coherent implementation of policies to redress the imbalance.

8.2 Proposal

Following discussions with a number of organisations, the DDU agreed to review and summarise the broad background to the problem and propose some solutions as a basis for discussion.

8.3 Approach

The DDU researched the range of issues associated with the problem and reassessed the current position

8.4 Progress to Date

The DDU produced a paper that restates the broad background to the problem and proposes some possible remedies as a basis for discussion. The main proposals were and still are:

- a serious effort to package work-streams, especially through established government programmes and local regeneration schemes, so as to encourage/require installer companies to take on trainees;
- use of the planning system to require training as part of the planning gain for major developments;

- wider availability of re-skilling training through Department of Work and Pensions (DWP) programmes;
- better promotion of gas work as a career option for young people;
- better financial incentives for trainees; and
- mechanisms for enabling small businesses to expand more easily.

8.5 Future Potential

The paper was written by the DDU to provoke discussion and was not aimed at supporting or amending any particular Government policies. The paper acknowledged that many of the ideas it contained have already been discussed, and many of the necessary resources required already existed. What is needed is a co-ordinated, determined effort by all parties to work together to deliver change in a very conservative and fragmented sector. Many of the ideas proposed in the paper could apply to the promotion of other energy industry skill sets that are in short supply.

8.6 Next Steps

The DDU continue to review the scope for and value of a workshop at which the complexity of the solutions can be further simplified and the way forward agreed.

9. The Way Forward

The DDU has carried out specific areas of research and analysis, developed a number of think pieces, and has delivered and is developing a number of demonstrator and pathfinder projects.

The aim of this work is to develop new, more effective mechanisms for delivering the Government's energy strategy, taking into account the three pillars of sustainability – social, environmental and economic.

The DDU will continue to demonstrate what can be achieved through the effective, practical delivery of scaleable solutions that are adaptable to diverse local and regional circumstances. The DDU will aim to demonstrate 'fit for purpose' solutions that are not only more widely replicable but can also provide a step change in output and cost.

Over the next twelve months the DDU will continue to analyse the status quo, develop and design models and funding arrangements, undertake field trials and review and disseminate the outcomes. The successful outcomes will be those that provide solutions that meet Government's multiple objectives at least cost, whilst significantly improving the lives and well-being of those least able to afford to make changes.

To achieve success we need to leap-frog the status quo not only because evolution is too slow a process to achieve the improved effectiveness and efficiencies in key policy areas to meet the Energy White Paper targets but also because it is the most effective means of by-passing the guardians of the status quo.

Annex

Detailed Work-Stream Evaluation

Leap-Frogging the Status Quo

1. Work-Stream 1 - Gas to Non Gas Communities

1.1 Overview

The report of the Working Group on Mains Gas Extensions found that access to cheaper fuels, particularly mains gas, would alleviate some of the problems associated with the poor energy efficiency of the housing stock. Although extending the gas network to everyone would be prohibitively expensive, there is much evidence to suggest that it could prove a financially viable means of significantly improving the living conditions of many.

Since the liberalisation of the gas industry communities to which the gas network is extended are required to pay the full cost of connection. New access to the gas network has, therefore, been limited to new housing developments and wealthier communities. The deprived communities who would derive the greatest benefit are least able to afford connections. These communities continue to be excluded from the substantial economic, environmental, social and health benefits that accrue to communities with access to gas.

Access to cheaper fuel, its more efficient use and improved household insulation has major socio-economic benefits. Community access to cheaper fuels, particularly mains gas, and more efficient heating technologies would:

- reduce fuel costs providing more disposable income to spend on other essential items such as food;
- reduce mortality and incidence of cold related diseases and illnesses;
- increase warmth and comfort with a raft of quality of life improvements;
- provide year round access to all rooms, with benefits for family life and education;
- provide a more convenient form of energy;
- improve the overall energy efficiency of the housing stock;
- reduce building fabric and material damage; improve internal and external air quality and reduce incidence of respiratory diseases, particularly childhood asthma; and
- reduce emissions of greenhouse gases.

The Working Group's conclusions have been supported by research undertaken by the Fuel Poverty Advisory Group (FPAG) which shows that the most effective measure for removing a household from fuel poverty is to fit a gas central heating system. This has been confirmed by research on the Scottish Central Heating Programme, where it has been found that the installation of central heating and energy efficiency measures removed 87% of households from fuel poverty.

Additional analysis undertaken by the DDU indicates that nearly 9,000 community clusters of 50 homes or more do not have access to a gas supply. Of these clusters over 4,600 are within 2kms of a gas main. Indicative costs suggest that with a critical mass of homes connecting in year one, 75%, the communities can be connected for an average cost of £863 per household.

To create a business model that utilises a range of funding options and can act as a blue print for future mains gas extensions, the DDU is undertaking a number of demonstrator

projects. Analysis of the first project - a community, in Llay, in Wrexham - indicates that at a 90% penetration level the community was connected at a cost of £85 per household.

1.2 Results of Analysis

Following the working group's report, work has continued to develop an understanding into non-gas communities. Transco AWP's initial study of non-gas communities of greater than 150 homes has been developed to identify non-gas households in clusters of 50 or more. The map of these clusters has been overlaid with the ward level index of multiple-deprivation, to identify non-gas communities in terms of both cost and deprivation.

Research to date indicates that 8,996 community clusters of over 50 households that do not have access to a gas supply. The breakdown of these communities is shown in Table 1 below:

Table 1 – Breakdown of Community Clusters

	No. of Non Gas Household Clusters (>50)	Total No. of Non Gas Households
England	7,120	876,510
Scotland	1,246	208,938
Wales	630	81,186
Total	8,996	1,166,634

1.3 Communities within 2kms

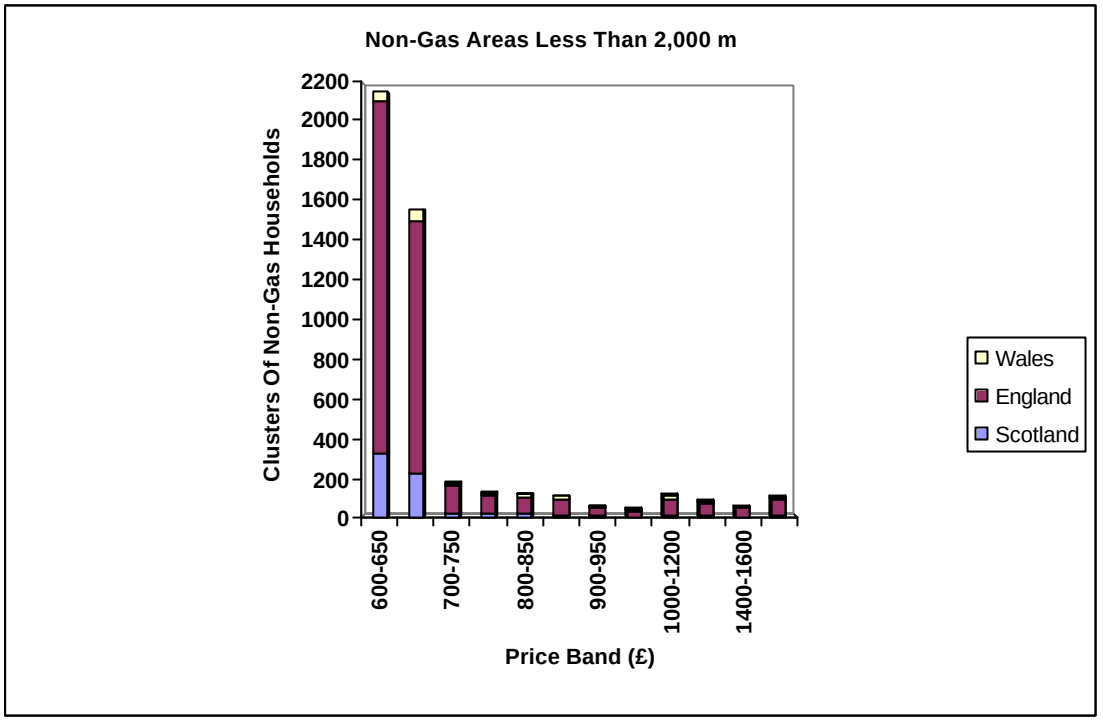
Of the 8,996 community clusters without access to a gas supply, 4,654 representing 525,267 households are within 2kms of an existing gas main.

A coarse screening analysis that assumes a 90% penetration concludes that the following numbers of communities that could be connected and their indicative costs are:

- 2150 communities costing below £650 per household
- 2075 communities costing above £650 but below £900 per household
- 199 communities costing above £900 but below £1200
- The remainder costing over £1200

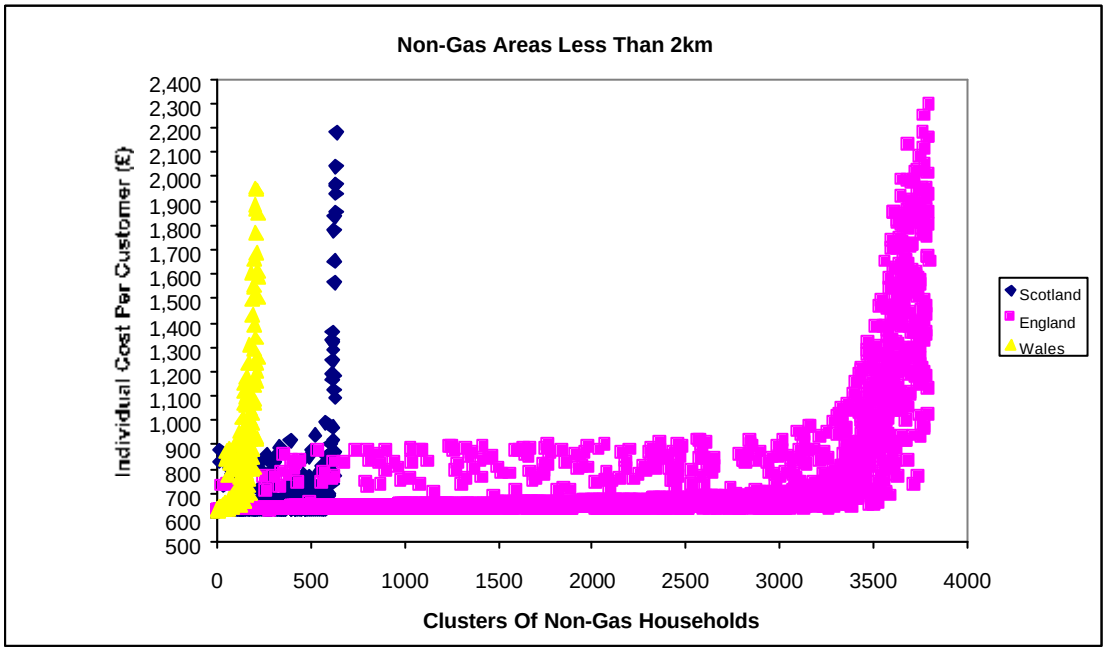
These details are represented in Graphs 1 and 2 below:

Graph 1 – Community Clusters Less than 2 km from an Existing Gas Main



This information transferred to a scatter graph shows quite clearly the substantial number of community clusters that could be connected below £900 per household.

Graph 2 – Community Clusters – Connection Cost Price Ranges



This data is being refined to ensure that all costs, for example additional costs associated with connecting non ground floor flats, upstream reinforcement, and independent Gas Transportation (iGT) networks etc, are accurately reflected in the final cost ranking.

1.4 Impact on Fuel Poverty

The DDU estimates that in the 4,654 clusters within 2kms of the established mains, there are some 105,053 households in fuel poverty, 87,194 of them are estimated to be vulnerable fuel poor households.

1.5 Costs of Connection

The DDU has also undertaken additional analysis on the community clusters to assess connection costs at various levels of penetration. Individual connection costs have been determined for the 4,654 community clusters identified as being within 2kms of a gas main. These connection costs suggest that at a 100% penetration level households can be connected for an average of £705 per household. Additional costs for a number of penetration levels are shown in table 2 below:

Table 2 – Connection Costs at various Levels of Penetration

Indicative Average Connection Costs for Communities within 2kms of a Gas Main					
	Penetration Levels				
	100%	90%	75%	60%	40%
Total No. of Households Connected	525,267	472,740	393,950	315,160	210,107
Average Connection Cost	£705	£757	£863	£1,021	£1,416

1.6 Demonstrator Projects

The DDU undertook to develop 5 demonstrator projects to prove the concept of this alternative model for extending the gas network to fuel poor communities off the mains gas network.

Utilising the project management resources of Transco's Affordable Warmth Programme (AWP), the DDU has developed a community-based model to extend gas in to energy poor non-gas communities. Acting as programme managers AWP bring together a number of organisations – Local Authorities, energy suppliers, gas transporters, network design companies, engineering contractors, central heating suppliers/installers and others.

Each community is given a complete package of measures – gas connection, energy efficiency measures, energy advice and efficient gas central heating systems. Homes are targeted using a systematic whole-house, whole community approach, similar to that adopted in the Warm Zones model. The success of each project is determined, not only by many organisations working together in partnership, but also through a critical mass of households connecting in the first year.

Funding for central heating systems and financing for the project comes from a number of funding partners, Local Authorities, devolved administrations, Warm Front, energy suppliers, European Regional Development Funds, Regional Development Agencies and other local funding organisations such as Neighbourhood Renewal.

The first community to be connected was a 450 home ex-coal mining community in Wrexham. By applying the DDU model, connection costs were reduced to £85 per household, from the £720 originally quoted to the community using the traditional regulated pricing methodology. The Local Authority subsequently offered to pay the £85 so the houses were connected at nil cost.

The DDU's five pilots are now complete, providing over 1,000 households with a more efficient heating system. A further 9 communities are at various stages of development, shown in Table 3 below and ten more projects are at the conceptual design stage.

Table 3 – Community Based Mains Gas Extensions

Community Location	No. of Homes Potential	Status
Wrexham	398	Complete
Glasgow	116	Complete
Easington	146	Complete
Milford Haven	400	Complete
Neath Port Talbot	90	Complete
Weston Super Mare	80	Under Construction
East Lothian	480	Under Construction
Falkirk	740	Under Construction
Rocester	750	Committed
Leeds – 5 Communities	1400	Under development
Total	**4600**	

1.7 Whole Community Approach

If the demonstrator communities are to extract the benefit of a gas connection there are considerable additional costs, for example, the installation of efficient heating systems and insulation measures. The delivery model therefore extends beyond the simple proposition of bringing gas to a community and applies a systematic whole community/whole house approach. The model seeks to integrate numerous, national, regional and local funds targeted at fuel poverty, energy efficiency and regeneration in a holistic approach that matches the needs of the targeted community with a range of solution providers. This gives the capacity to maximise on the number of first year connections and potential exists to generate a 'gap fund' for the considerable number of fuel poor households who do not qualify for support under conventional programmes. For non-fuel poor, non-qualifying households the DDU intends to develop and promote a preferential finance package and to offer the considerable economies of scale that the programme can deliver.

1.8 Barriers

By developing a delivery model that enables a critical mass of homes within each community to be connected in year one unit costs of connection can be considerably reduced and a substantial number of communities will now be able to afford connections. However the complexity of the current funding model requires considerable staff effort and is bureaucratic: - ways have to be found to consolidate the funding arrangements.

The demonstrator projects have highlighted the potential impact on the programme provided by the current arrangements whereby gas transporters have the capacity to increase their charges above the Transco equivalent published rate. A mechanism exists that allows the transporters, over-time, to recover capital costs through a revenue charge. For example in the case of Llay the impact of recovering an additional 10p per therm would:

- Facilitate an increase in the asset value of the connection.
- Reduce the capital cost of the connection by an additional £250 per household.
- Reduce the connection cost per household to minus £165.
- Increase individual household gas bills, based on current prices by some 17%.

The DDU's analysis supports the conclusion that whilst the application of Transco equivalent transportation charges will allow a significant number of communities to be connected, a supplemental charge levied on the gas transportation charge would significantly increase this number as the upfront capital cost of connection could be spread over a number of years and recovered through an increase in transportation charges.

The DDU utilising the expertise within the Transco AWP worked closely with Ofgem, undertaking scenario analysis to establish and support proposals for the introduction of supplemental charging to the benefit of community mains gas extension projects. A modification to the gas transportation licence that took effect in January 2004 allows a surcharge to be levied on the gas transportation charge to specifically enable the gas transporter to contribute towards the additional costs of pipeline infrastructure associated with mains gas extension projects for existing communities not on the mains gas network. A surcharge of up to 10 pence per therm over a period of 20 years has been allowed for these network extensions, although this surcharge will be kept under review by Ofgem.

1.9 Multi-Utility Concept

The DDU have entered into discussions with a water company to determine if synergies exist for the provision of gas infrastructure construction when 'first time sewerage' is being installed.

A detailed mapping exercise has been undertaken to assess the number of communities that are not connected to both the mains gas and sewage networks. Ten communities have been identified where further detailed design analysis is required.

1.10 Coalfield Communities

Coal-mining communities are disproportionately represented in the non-gas community register because, for various reasons, particularly the ready availability of coal and an historic loyalty to its use, they were not connected to the mains gas network during the massive, publicly funded development of the gas network before privatisation. Since privatisation, communities have had to pay the full cost of any development and this has put gas beyond the reach of the most deprived coal mining communities.

There are 174 ex-coal-mining communities with 20,043 households within 2kms of the established gas network. 109 have an IMD score greater than 25. There is a clear opportunity to establish a programme that targets this specific group of deprived communities while at the same time addressing a major social distortion created by the coincidental demise of the coal industry and liberalisation of the gas industry.

Table 4 - Coal Mining Communities Within 2 km of a Gas Network

Government Office	Communities < 2km	No. of Households
East Midlands	54	6,819
North East	21	2,004
North West	3	267
South East	3	159
South West	9	1,548
West Midlands	37	4,117
York. & Humber	47	5,129
Total	**174**	**20,043**

The DDU believes that there is a strong case to target these communities with a specific regeneration programme of activities. To this end, preliminary meetings have been held with ODPM (Office of the Deputy Prime Minister).

1.11 Lottery Funding

The Government's White Paper, 'Choosing Health', acknowledged the effect that poor quality housing and associated low levels of thermal comfort have on family health. Whilst poor housing is encountered across society, it is concentrated in the most deprived communities. A 'total solution' community-based energy efficiency programme can address the housing inequalities, and the consequent economic, environmental, social and health inequalities, in these deprived communities.

To enable a wider roll out of a mains gas extension programme significant funds will be required. The DDU has explored a number of options for providing seed funding for such a programme and has held a number of discussions with the Big Lottery Fund.

The provision of grants from the Big Lottery Fund would enable this proven model to be employed on a larger-scale, providing a foundation for a substantial programme of work offering a whole package of measures to qualifying non-gas communities.

Providing affordable warmth and increasing disposable income for these households in these communities can make a significant difference to an individual's life and increase the prosperity of the whole community through the creation of ancillary training and employment. However, despite the DDU being convinced that this programme aligns closely to several themes of the Big Lottery fund – the DDU has been unsuccessful in securing an allocation of funds from the Big Lottery Fund.

2. Community Renewables

2.1 Background

The majority of DDU's community work, to date, has tested and proven funding and delivery models for aiding deprived communities that could be connected to the gas network at reasonable cost. The work has shown the importance and suitability of the whole community, whole house total solution approach, under which communities are tackled as a whole, rather than on activity being focused on individual households. It has also confirmed the close correlation between deprivation and fuel poverty, which assists in targeting both DDU projects and other energy-related activities.

Extending the gas network to everyone would be prohibitively expensive and therefore the DDU is currently evaluating the effectiveness and financial viability of community based renewable energy sources as a means of reducing atmospheric emissions, eradicating fuel poverty and significantly improving the living conditions of many.

Analysis indicates that of the 9,000 communities that do not have access to a gas supply over 4,300 are outside the economic range of a gas main. The introduction of community based renewable systems to these unconnected communities has the potential to offer considerable economic, environmental and social benefits.

Renewable technology deployed at the community level is currently an unexplored option to provide cheap sustainable forms of energy. The technology when aligned to an innovative market based solution that establishes project efficiencies and economies of scale and develops partnership approaches with the full range of available solution providers could substantially reduce the capital costs.

To evaluate the efficiency and cost effectiveness of a range of renewable technologies that can be deployed in targeted communities it was proposed to design, develop and demonstrate the viability of five pathfinder projects. It was intended that these projects would create a business model that utilises a range of funding options to allow a 'whole community whole house' approach to be developed. The projects would be thoroughly evaluated from an internal and external cost and benefit perspective and the capacity to replicate these schemes to other communities would be assessed.

The principal objective of the pathfinder projects was to prove the viability of the technology and to facilitate the development of a new market based programme for renewable technologies to assist the Government meet a number of stated environmental and social policy objectives and targets. Specifically the original objectives were:

2.2 Renewable Proposal

- DDU to identify, design and undertake five community based-projects and demonstrate their viability;
- target deprived rural communities;
- target a range of renewable technologies;
- run a fully integrated community project; and
- whole Community and single house solutions to be evaluated.

The DDU also stipulated a range of standards and performance criteria for all projects. These included;

- Proven technology; - this was not to be seen as a proving ground for non-market tested technology.
- DTI funding to be utilised as seed funding only; there had to be considerable leverage.
- Viability – using whole life costs the technology had to be economically viable.
- Running costs – had to be comparable to gas.
- Replicable – there had to be scope to replicate one off funding arrangements or community unique propositions were not to be included.

If the projects proved successful in terms of technology deployed, magnitude and range of benefits, cost effectiveness and availability of potential funds then a systematic roll out programme was to be established targeting equivalent communities. Like the gas extension work the pathfinder projects were designed to go beyond the simple provision of access to renewable energy and provide the full range of hard and soft measures.

The project also looked to maximise on a range of programme synergies and would seek to effectively integrate numerous energy efficiency, fuel poverty and renewable schemes into a holistic approach that matches the needs of a community with a range of solutions and funds. In doing so the project was geared to maximise on the available funding and grants available and seek to provide the maximum number of homes with the maximum number of energy efficiency measures as well as access to the cheaper forms of renewable energy.

As a large number of households do not benefit from established grant-aid support the project evaluated the potential to generate a 'gap fund' for non-qualifying fuel poor households. It was intended that the gap-fund would be obtained from non-traditional sources of funding such as Lottery Funding. For non-fuel poor, non-qualifying households it is the DDU's intention in all its programme work to develop and promote a preferential finance package and to offer the economies of scale that the programmes can deliver.

2.3 Project Work

Work to date has highlighted that because of the small numbers of renewable technologies installed in the UK, the efficiencies associated with scaling-up activities have not been fully evaluated. In addition, the existing grant regime has the effect of distorting the market, targeting single home, middle-England developments and supplementing high profile technologies to the possible detriment of the more cost effective.

Taking these issues into consideration the DDU is undertaking a review to identify what changes are required to make progress in the community renewables arena. The DDU for funding and resource efficiency reasons has chosen to advance the community renewable pathfinder projects through the implementation of Work-Stream 3: - Regionalisation.

Taking these issues into consideration the DDU is undertaking a review to identify what changes are required to make progress in the community renewables arena. A number of specific pilots are being established and these are discussed in more detail below.

Working with a range of partners a number of projects have been evaluated. These projects include a mix of renewable energy and technologies including biomass Combined Heat and Power (CHP) and district heating, wind turbines, heat pumps, PV, landfill gas and bio-oil. These are outlined in terms of viability in Table 5 below.

Table 5 – Technology Viability – Whole Life Costs

Technology	**Viable**	**Potentially Viable**	**Further Work**
Biomass CHP			✘
Biomass District Heating		✘	
Biomass Single Home		✘	
Solar Water Heating			✘
Community Wind	✘		
Heat Pumps - Ground	✘		
Heat Pumps – Air		✘	
Heat Pumps – Mine Water		✘	
Bio-oil			✘
PV			✘
Landfill Gas - Electricity	✘		
Low Head Hydro			✘

In summary the findings of the evaluation for some key technologies are:

- Biomass

The biomass industry is confronted with a number of significant challenges not least the issues of creating a coherent and efficient supply chain. More fundamentally is the lack of funding support for what should be a significant source of renewable energy for domestic properties throughout rural Britain. The Energy Efficiency Commitment (EEC) provides a fuel switching allowance to encourage households to switch to lower carbon intensive fuels. This fuel switching allowance is linked directly to the carbon content of the existing fuel and the size of house. For example switching a three-bedroom coal-burning house to gas would result in a one off payment of up to £550. However under the current rules for switching that same house to biomass there is no fuel switching allowance at all.

The provision of a carbon reflective fuel-switching allowance would, overnight, change the market economics for biomass in the domestic sector and more importantly would give the major suppliers a considerable stake in promoting the use of biomass heating systems with rural customers. Significantly if biomass technology did qualify for EEC, under the innovation uplift rules, it would receive a 50% uplift for the duration of EEC 2. This the DDU believes will be sufficient to kick start the market.

The DDU is working hard with others to clarify the reasons for this anomalous situation.

Biomass technology also does not benefit from reduced VAT. At face value it obviously does not meet standard energy savings criterion however its potential for carbon benefits clearly demands some recognition. A further step change 12.5% reduction in capital cost will compound the market impact of an EEC allowance.

Without the significant shift in EEC and VAT the biomass industry will struggle to compete with technologies in this grant distorted marketplace.

One other area of grant distortion that the DDU has encountered but needs to investigate further is in relation to DEFRA (Department of Environment and Rural Affairs) grants for the growth of biomass crops. DDU understand that these are only available for the production of intensively grown new crops. This criteria clearly excludes the more traditional low intensity production of wood even though this source of biomass is readily available throughout the UK and its promotion through grant support would have considerable ecological, recreational and landscape value.

- Heat Pumps

Heat pumps have a very wide variety of uses from cooling drinks in vending machines, industrial processes, and heating and cooling buildings. External energy, almost always electricity, is needed to drive a dedicated heat pump. As much as 4 kWh of heat can be provided by a dedicated heat pump absorbing just 1 kWh of electricity, with the balance of 3 kW coming from the environment as renewable heat energy.

For the most efficient heat pumps, heating costs are comparable with gas, and significantly cheaper than oil-based systems. The electricity absorbed by the most efficient dedicated heat pumps produces less than half the carbon emissions of a condensing gas boiler, and about a third of that produced by an oil boiler.

Dedicated heat pumps can absorb renewable heat energy from any environmental source – whether that is the air, rivers, ponds, the sea, or horizontal, trenched, vertical, drilled, or new compact pad type ground arrays. Most buildings in the UK have a suitable environmental source for heat energy to be absorbed. For example, every building in London has in theory unlimited access to the renewable heat energy in the water table beneath it, and the potential of these resources are now starting to be better understood.

In recent years a new type of heat pump has emerged, called a “dedicated air to water heat pump”. Unlike ordinary heat pumps, these devices are specifically designed to absorb heat from the environment, and they put this out in the form of hot water. Their most common application is for space heating and domestic hot water. Because they are “dedicated” to absorbing renewable heat energy, they are recognised as “renewable energy devices”.

After GSHPs, ASHPs are the next most developed area of the heat pump market. GSHPs can heat any size of building, from very small houses up to large hospitals, government buildings and schools. ASHPs are generally only for domestic and small commercial applications.

Dedicated heat pumps are ideally suited for installation as part of the construction of new dwellings, especially when combined with other energy saving measures such as high quality insulation and "wet" under-floor heating systems. ASHPs have the potential to retrofitting into existing dwellings, as no drilling or digging for ground arrays is required. This makes them particularly suitable for tackling rural off-gas grid fuel poverty where there are constraints on GSHPs.

There are other sources of heat for heat pumps. These include variations on the source of heat. For GSHPs these systems use heat stored in: mine water; deep-rock (geothermal heat); river and lake water; seawater; and wastewater and effluent. These particular heat pump markets are at a more formative stage than ground and air source heat pumps but will continue to be evaluated. In particular the potential to utilize mine water will be one aspect of the community renewable work undertaken in Work-Stream 3.

- GSHPs

GSHPs proven throughout Europe have offered an efficient alternative source of domestic heating in terms of running costs. To date the market for the technology in the UK has been slow to develop. The most significant barrier to take-up of GSHPs is the initial capital investment required, with installation costs making up 50-70% of the costs of an installed GSHP. The DDU is currently working with a number of manufacturers and installers to evaluate the cost-chain with the objective of designing a new delivery model that has the capacity to substantially reduce capital costs. Early indications are that the potential exists to make GSHPs a viable technology.

- ASHPs

The new generation of ASHPs have the potential to be a breakthrough technology in terms of domestic space heating. Although not as efficient as an equivalent GSHP its ease of installation and wide range of application means it has huge market potential. For this reason the DDU are facilitating a number of projects down the spine of the UK to prove this new technology in a number of climatic conditions.

These projects are resulting in small numbers of ASHPs being installed with the largest pilot being in West Yorkshire where 31 units are being installed. Without a significant number in place this technology will take a considerable period of time to establish itself in the domestic market. To compress the time frame the DDU is currently designing a 500 home funded trial that will be subject to detailed independent assessment.

- Community Wind

The DDU has undertaken research into community based wind and has discussed with a number of energy suppliers the concept of a localised community-based energy tariff to give communities a stake in the development of a community wind project. Whilst discussions have been encouraging development issues have remained a barrier to a Demonstration project.

The DDU continues to work through these issues with a view to establishing a viable community based wind proposition in an off gas fuel poor community. (See case study below).

- PV

The current cost of PV is very high with retrofit being prohibitive. Notwithstanding the DDU has designed and facilitated a marginal cost project in Redcar and Cleveland. Working in partnership with a number of other organisations including Coast and Country Housing, a very progressive social landlord, a small project has been developed. (See case study below).

- Solar Water Heating

Space heating offers the largest potential energy saving in most UK households. Therefore the DDU's work has tended to focus on the opportunities to maximise on these savings at least cost. The DDU currently view the high capital cost of in the conventional solar water heating market as prohibitive but will work with suppliers and installers to evaluate scope for efficiencies.

- Bio oil

The Warm Front programme is pursuing the option of oil fired domestic boilers the opportunity to generate a renewable fuel to fire these boilers is compelling. In regions where suitable processing facilities are available or being developed the DDU will seek to establish the business case for this opportunity recognising that bio-oil is challenged by the same market distortions that apply to bio-mass.

- Low Head Hydro

There are several hundred established weirs throughout the UK where water turbines could be installed to generate electricity. The DDU is investigating the development of a 'fit-for-purpose' design option to reduce costs and inform thinking in what is an obvious area for future development.

- Landfill Gas

Screening analysis would suggest that generating electricity from landfill gas is in most instances a commercially viable option. Aligning the development to the provision of discounted electricity to adjacent fuel poor housing is also an attractive short term proposition.

2.4 Case Studies

2.4.1 Colden Biomass

Colden is a 56 home community in Calderdale. It consists of primarily stone built, hard to treat, terraced cottages heated with a mix of coal, oil and electric.

To reduce the heating costs of the community and provide affordable warmth, a number of technology and fuel options have been considered - gas connection with condensing boilers, oil boilers, biomass pellet boilers & room heaters, and biomass district heating. Given the make-up of the community and housing stock an initial feasibility study

concluded that a biomass district-heating scheme would provide the most cost effective solution.

Through the work of the DDU project management team the original capital and installation costs of the district heating scheme were able to be reduced by 15% with the cost of heating being provided at a price comparable to gas - an overriding aim of the project. For the scheme to be viable it required a contribution from owner-occupiers of some £1,500 for internal pipework and radiators etc, with 90% of the households supporting the proposition at the conceptual stage. Following considerable detailed work with extensive community involvement and consultation only 40% responded positively to the contractual arrangement for the scheme.

The lack of positive response means that the district-heating scheme will not go ahead. However, the DDU is continuing to work with the community to assess other forms of technology solutions, such Heat Pumps. This will prove challenging given the 'hard to treat' nature of the housing stock.

2.4.2 Redcar PV

Utilising the project management skills of the DDU, a project has been developed for the provision of localised generation of electricity using PV panels on a flatted development in Redcar & Cleveland. A funding package has been developed for the project with gap funding being secured from the EST's Major Photovoltaics Programme.

The project is to install PV panels across 7 blocks of flats owned and managed by Coast & Country Housing - the largest not for profit social housing provider in the Tees Valley. The multi-storey blocks have all been fully insulated as part of the Warm Zone project and provide residential accommodation for low-income families. The PV panels will be installed as part of a planned re-roofing programme, commencing Autumn 2005. As the project is not a specific retrofit initiative the activity can be carried out with minimal disruption to the residents and providing overall project economies for on site working.

The electricity generated from the PV installation will be exported to the distribution network generating an income for Coast & Country Housing. This income will be used to provide reduced cost non-statutory services for the tenants and to assist with the delivery of other renewable energy and energy efficiency project /services within Coast & Country's housing stock. This arrangement is designed to provide improvements to tenants, for instance - through better living conditions, increased warmth and reduced energy bills.

As part of the proposal Coast & Country electrical engineers will undertake PV training modules at Cleveland College as part of the City & Guilds module, so that projects can be self-sustaining.

2.4.3 Sunniside Wind Turbine

The DDU has undertaken research into community based wind and has discussed with a number of energy suppliers the concept of a localised community-based energy tariff to give communities a stake in a community wind development. Whilst discussions have been encouraging, planning issues have remained a barrier to take-up.

A feasibility study has been undertaken in a 112 home community in Sunniside, Bishop Auckland. The homes currently use a mix of fuels, but is predominantly coal, causing handling problems for elderly residents. The study concluded that Sunniside was suitable for small community based wind turbines to be installed in conjunction with ASHPs, GSHPs and electric storage heaters. The electricity generated from the wind turbine would supplement the capital and revenue costs for the heating technologies to be installed, providing affordable warmth at reasonable cost to the community.

Several suppliers were approached who have established wind business proposals that hinge on engaging the support of the local community, providing discounts/community sponsorship as a way of rewarding the community involvement. Perceived barriers with respect to localised energy tariffs were also addressed to enable suppliers to offer discounted electricity tariffs over the life of the development giving households a significant financial stake during the life of the project.

Despite support from the local council, the wind turbine element of the project has not been viable due to the lack of available sites. The project is continuing with a view to installing a mix of technologies where they are deemed to be affordable and meet household and community needs.

The DDU continues to work through the various issues of community wind, with a view to establishing a community based wind proposition in an energy poor community.

3. Work-Stream 3 - Regionalisation

The Energy White Paper proposes, "In future there will be greater emphasis on local and regional approaches in delivering our energy objectives" and goes on to specify a number of related commitments including:

- build on the existing work with local and regional bodies to develop a new package of measures to promote national objectives through local and regional decision-making; and
- take steps to ensure that a strategic approach to energy is developed and implemented in each region.

It was therefore timely for the DDU to re-evaluate the opportunities presented by a more regionally based approach to the delivery of the established national programmes to address domestic energy and fuel poverty. While the DDU accepts it may be too early to contemplate the transfer of accountability it is sensible to start to evaluate the opportunities presented by a more regionally focussed approach and develop the thinking and more importantly the geographical delivery framework that will facilitate this transfer over time.

The DDU believes that the eradication of fuel poverty and improved domestic energy efficiency requires good complementary supply side management to bring the necessary resources and investment to bear in a coherent and transparent manner. Once available there is a fundamental need for complex end-to-end processes to manage the demand side efficiently and flexibly; - matching the particular energy efficiency needs of individual communities and the fuel poor households within those communities to particular

solutions and resources. The variety of funds available, their complexity, their delivery vehicles and the fact that they often have inconsistent qualification criteria has to-date caused a number of structural delivery problems. Part of the problem is:

- effective targeting of available resources;
- the lack of integration between the many conventional schemes;
- the lack of flexibility to tailor solutions to individual circumstances; and
- the lack of effective delivery coordination.

The DDU concludes that by establishing a regional delivery mechanism, based on the current government office arrangements, the matching of demand and supply in all its local complexity and diversity can be accommodated. Available resources can be targeted and integrated effectively and delivery of measures can be efficiently coordinated. Moreover such an approach will we believe offer substantially the greatest benefit for any given level of expenditure.

The White Paper recognises that delivery of the goals will rely on local authorities and regional bodies working with the private sector and voluntary groups, to help to deliver real change on the ground, reflecting the needs of their different communities. By establishing a regional delivery framework that facilitates the integration of the range of funding options available at a national, regional and local level there is the opportunity to put in place more effective real and virtual local and regional arrangements for deploying renewable technology, eradicating fuel poverty and improving domestic energy efficiency in a focused and systematic manner.

3.1 The Development of the Community Energy Solutions Project

To test thoroughly the potential of the regional model the DDU has established partnerships with Regional Development Agencies (RDAs) to drive forward a demonstrator project that is geared towards proving the efficiencies of a regional partnership that links together a chain of funding and undertakes its activities in a coherent and systematic manner.

The DDU is convinced that there is an opportunity to develop a new regional delivery model to make both the extension of the gas network to deprived communities more effective and compelling, and renewable technology viable: - both in a true market based context.

This new market-based solution is required to facilitate a wholesale and concentrated role out of the gas network extension programme and also to address and overcome the market failures that have restricted the delivery of renewable energy technologies. The project hopes to overcome a number of existing market barriers and failures, including: poor strategic framework with insufficient clarity on overall aims and priorities; lack of coordination and efficiency across many different programmes and funding sources; ineffectively targeted grant regimes; undue focus on specific technologies; insufficient focus on project delivery; and a lack of market dynamism.

The challenges associated with developing and proving such a solution are considerable, including establishing significant cost efficiencies and the ability to flexibly and

responsively apply innovative techniques and technologies in the pursuit of leading practice as regards all aspects of community sustainable energy.
To meet these challenges a number of regional pilot projects are planned in order to test and develop this new model, with the aim of generating a robust blueprint that can be taken into the mainstream for wider, large-scale application and delivery of proven solutions, both regionally and nationally.

The first project has been developed to deliver this integrated, community-based energy pilot programme to deprived communities in the North East of England. Community Energy Solutions (North East) Ltd will be the flexible and responsive delivery vehicle, established by DTI and ONE (One North East). The appointed Board of this company will manage and deliver the pilot in partnership with players across the North East region.

The project will be based on:

- a "whole community, whole house" package of affordable warmth measures;
- provision of gas connections to non-gas areas with the provision of high efficiency gas-fired heating systems to qualifying households; and
- provision of renewable energy and/or associated technologies.

This programme has core funding and support from the DTI and ONE.

The project will integrate a number of the Government's Energy White Paper policy objectives by deploying at a community level less carbon intensive fuels and promoting the economically viable delivery of community-based renewables. It aims also to substantially lower the energy costs of vulnerable households, both through energy supply side measures and comprehensive packages of in-house demand side solutions and benefits advice. It is intended that the pilots should deliver and test models that can be replicated throughout the chosen regions and Great Britain. The pilots may also provide the basis for future bids to central Government for support for a regional, community-based energy programme.

Wherever it is practicable, viable and economic to do so, the programme will also actively engage with a wide range of parties within the region and across the project development and associated supply chains to contribute to the wider strategic goals of local and regional regeneration.

3.1.1 Measurement of Success

The success of the regional projects will be measured by:

- the number of homes assisted;
- the impact of the measures delivered on fuel costs and energy efficiency;
- the ability to drive down capital and installation costs;
- the reduction of carbon dioxide and other atmospheric emissions;
- the number and mix of renewable energy technologies delivered;
- the number and distribution of communities assisted (including region spatial distribution and the mix of rural and urban projects);
- the proportion of overall project spend invested in the North East region; and

- the measured improvement in community health.

It is also intended to start the process of measuring regeneration outcomes throughout the pilot project, with the aim of more meaningfully tracking these outcomes on a longer-term basis.

A full independent evaluation of the pilot programme will be undertaken which will measure project performance against the full range of defined outcomes.

3.1.2 Aims and Objectives

The project aims to deliver community-based renewables projects and gas to non-gas communities in deprived areas in the North East of England, combined with a package of cost-effective domestic energy efficiency and fuel poverty measures. In so doing, the project will:

- significantly improve household energy efficiency and aim to eradicate fuel poverty in the deprived communities served;
- contribute to meeting local and/or regional environmental targets;
- facilitate regeneration in these communities and beyond;
- develop and support the early market in renewable energy technologies to establish commercial viability;
- improve the housing stock in areas of greatest need; and
- demonstrate successful delivery methods and innovative funding partnerships for community-based schemes, thereby generating a robust and applicable blueprint for wider use.

The project will operate initially for a two-year pilot phase from September 2005. During this phase, the aim is to establish funding of at least £8million and assist at least 20 communities of a minimum of 50 homes and with a multiple deprivation index (MDI) score of 25 or over. The intention is to work towards an approximately equal mix of urban and rural based projects. The project also aims to invest at least 60% of overall programme spend in the North East region in order to demonstrate a tangible contribution to regional regeneration.

The North East has been chosen as the demonstrator region for this initiative for a number of compelling reasons, including:

- the fuel poverty status of the region;
- the region's proven track record and expertise in tackling fuel poverty and improving domestic energy efficiency;
- regional leadership in developing and promoting renewable energy technologies;
- the presence of a significant number of rural and urban deprived communities with a strong potential to benefit from this project; and
- the interest and commitment shown by ONE.

The project will also have the backing of Transco's AWP, both through its role in supporting the DDU and in providing initial delivery management and logistics.

The project will be delivered through a legal entity known as Community Energy Solutions (North East) Ltd.

An alternative structure for the company is currently under active consideration in the light of developments in Community Interest Companies (CICs). Once full details of the regulatory framework for CICs are available, a review of registration requirements will be undertaken. The DDU intends to take the lead by working with the DTI's small business support group and the appointed regulator to drive forward the concept of CICs.

3.1.3 Coverage

All projects will be wholly within the North East Region. The intention is to ensure an equitable split of the 20 projects across the regions, including a mix of gas mains extension and renewables-based projects in both rural and urban settings, subject to securing appropriate funding and cooperation from specific project partners most important of which are local communities.

The pilot project will also work towards a target of 50% of projects to benefit rural areas.

3.1.4 Communities

Communities will be either:

- a concentrated cluster of 50 or more homes with a MDI greater than 25; or
- 50 or more dispersed individual vulnerable and fuel poor homes within a specific, clearly defined geographical area.

It is recognised that in rural areas IMD data at ward level may mask localities of much higher deprivation. Local knowledge accessed through the local authority, health sector and other community-focussed organisations will be utilised to assure an equitable targeting of communities as far as is reasonably practicable.

3.1.5 Qualifying Homes

Qualifying homes under the CES programme are those that would qualify for measures under conventional energy efficiency programmes such as Warm Front and EEC (i.e. households claiming certain 'passport' benefits') together with vulnerable households in fuel poverty. Vulnerable households are defined for this activity as pensioner households or households with children under the age of 16. Fuel poverty occurs where a household has to spend 10% or more of its income in order to meet fuel costs.

To achieve 'affordable warmth', householders should be spending under 10% of their household income to maintain a level of warmth consistent with health and well being – for healthy adult households this is 21 degrees centigrade in main living areas and 18 degrees centigrade in other areas.

Fuel poverty is clearly linked to general poverty and deprivation and is firmly associated with:

- low income and debt;

- poor housing, household insulation and ventilation standards;
- inefficient or expensive heating systems;
- lack of access or availability of affordable fuel and/or tariff options; and
- under-occupation of homes.

It is normally a combination of these factors that lead to fuel poverty and often they may reinforce one another. In making an evaluation of fuel poverty it will also be important to consider the fact that certain households have a greater requirement for heat and hot water than the average household because they may be spending longer periods of time at home. This might include those households that include older people, those with long-term illnesses or disabilities, the unemployed and households with young children. These households tend to be on lower incomes, although not necessarily on benefit, and at the same time may have less access to finances to improve their situation through improvements to their homes or appliances.

3.2 Renewable Energy Technologies

3.2.1 Overview

A key aim of the programme is to establish delivery models and funding for a range of technologies that are practicable, viable, and economic. A "proof of concept" approach will therefore be adopted. It will demonstrate commercial viability through cost-effective delivery of schemes, the aim being to provide models that can be effectively replicated elsewhere in the North East and Great Britain.

Rather than prescribe potentially viable technologies, the project will adopt a criteria-based approach to provide a transparent and consistent framework for evaluating technologies against the programme's aims and objectives.

All relevant renewable technologies will be kept under active review during this project and consideration will be given to the full range of such technologies on a case-by-case basis, particularly where the specific project funding, aims and circumstances merit such a review. Opportunities will be sought within the programme to deploy less commercially proven and/or emerging technologies on a small-scale demonstrator basis where it is practicable and appropriate to do so.

A core aim of this project is the cost-effective delivery of appropriate renewable energy and renewable energy technologies to deprived communities across the North East. As such, it is vital that the technologies employed result in a robust, economically sustainable supply of energy to these communities on a "competitive cost" basis (see below). However, it is also recognised that there are wider project objectives, including the contribution to both rural and urban regeneration, as set out in Section 3.1.2. The selection and deployment of specific renewable energy technologies will be considered within the framework of the criteria set out below, considering the full range of relevant project circumstances in each case.

The pilot project will consider full lifetime costs for all projects: - capital purchase, installation, operation, maintenance and decommissioning costs; over the reasonable working lifetime of the technologies when assessing the cost-effectiveness of each specific project. It is critical that energy and heating in particular, is provided to

communities on a "competitive cost" basis. A heating cost equivalent to that of mains gas is the initial benchmark.

The pilot project will proactively engage with the appropriate regional players and business networks and will aim to invest at least 60% of overall programme spend in the North East region, with a commitment to review this target as the project unfolds.

Regionally based manufacturers and/or suppliers of renewable energy technologies and insulation will, wherever practical, be actively encouraged to participate in the project to stimulate regional economic regeneration, although the final selection of technology and manufacturer/supplier will be based on clear commercial selection criteria. Provision of project services particularly those associated with assessment, surveys construction, installation and servicing will, in the first instance, be sourced exclusively from within the North East. Where there are opportunities to establish larger, more cost-effective support arrangements between the North East and Yorkshire, companies in both regions will be encouraged to support the initiative. Where a recognised skills shortage exists in the North East, the programme will seek to facilitate the training and acquisition of necessary skills. This will extend to establishing funding opportunities for training and organising training events/courses.

3.2.2 Renewable Energy Technologies: Draft Project Selection Criteria

The sustainability criteria set out below will be used to assess the most appropriate renewable energy technologies (individually or in combination) in community renewable solutions, where mains gas connection is not viable.

This assessment will be undertaken when the cost effective connection to the gas mains i.e. where the cost of connection is greater than £950 for Transco equivalent transportation charges and £1,250 for a 10p per therm uplift has been eliminated as an option.

Economic Considerations:

- capital cost per household;
- installation cost per household;
- maintenance/inspection costs per household;
- running cost per household;
- unit cost of energy produced compared to gas;
- amortised cost on a 15, 25 and 50 year time horizon;
- process considerations (planning etc) affecting time costs;
- additional Grant funding or sponsorship opportunities for technology; and
- potential commercial/industrial applications.

Social:

- prevailing community views;
- community monetary saving (baseline costs for adequate thermal comfort – projected costs with new technology x Marginal Utility of Income Factor);
- extension to community buildings schools, village halls, churches etc; and
- employment/training prospects.

Environmental:

- contribution to reducing CO_2 emissions, monetised;
- contribution to reducing other atmospheric emissions, local and regional, monetised;
- achievement of local and regional strategic targets, monetised; and
- other external benefits, recreation, landscape, ecological etc monetised where possible.

Technology Considerations

- installation feasibility (buildings, infrastructure, sites etc);
- technology performance on similar applications;
- location based advantages (wind/water/mines);
- acceptability, reliability and usability of technology; and
- technology diversification.

The consideration of these criteria will primarily be based on the calculated monetary costs and benefits factors. However, value based judgement for softer factors will in certain circumstances be capable of overriding the other monetary issues, where effects are significant, positively or negatively.

Work-Stream 4 - Alternative Heating Options

The DDU supported by Transco's AWP, continues to conduct research into a number of the issue of hard to treat homes and the potential technology and fuel options available to the fuel poor living in these communities and in this category of housing. The research has included boiler efficiencies, fuel usage, running and equipment costs, and it must be acknowledged that research in these areas has been difficult given the high level of conflicting information available. The work has involved an evaluation of:

- the capital costs of equipment;
- the revenue cost of technology and fuels;
- the volatility of fuel prices, both seasonal and annual and the potential cost implications for consumers;
- the emissions associated with different boiler types and fuels; and
- the monetised environmental costs of the different fuels used in different boilers.

4.1 Alternatives to Oil

Following an evaluation of the Eaga Warm Front Programme '*Warming up vulnerable households – An evaluation of the Eaga Warm Front Programme and its effect on fuel poverty. Energy Audit Company, March 2003'* the Energy Audit Company recommends that where gas is not available that a high efficiency oil boiler be fitted. However preliminary research conducted by the DDU highlighted issues in relation to oil for space-heating, particularly for fuel poor households.

The initial analysis into this issue produced in November 2003 reached a number of conclusions regarding the suitability of oil for space heating to help reduce the number of

consumers in fuel poverty. In particular there were three key issues that make the wholesale use of oil a less attractive option for space heating:

- the volatility of oil prices, both seasonal and annual, have a significant impact on the heating costs of consumers;
- the higher capital costs of equipment, some £350 for an equivalent oil boiler; and
- the increased emissions of CO_2, particulates, and acidic gases.

The recent price increase has meant that oil fired central heating systems will only be a suitable solution for the most well-insulated or smallest of fuel poor households.

4.2 Hard to Treat Homes – Tower Blocks

Between 1945 and 1990 a total of 6,544 tower blocks providing some 440,000 homes were built in the UK. Although an unspecified number of these blocks have now been demolished it is estimated that the remaining units still provide homes for some 800,000 people.

Tower blocks tend to be concentrated in the most disadvantaged urban areas with the majority owned by local authorities or social landlords. Poor heating systems and little thermal insulation has resulted in a large number of these homes being cold, damp and the tenants being faced with high fuel bills.

Structural integrity issues associated with some tower block design has meant that individual gas heating systems are not appropriate and therefore the most popular single unit heating solution has been night storage heaters.

The DDU with the support evaluated the life-cycle costs associated with three technologies installed in multi storey developments to produce heat and hot water. The technologies assessed were:

- off peak electric storage heating;
- centralised gas fired boilers and district heating; and
- gas fired CHP/supplementary boilers and district heating.

The study draws on information from a large number of individual multi storey clusters and the costs associated with deploying the technology in different numbers of housing units was identified.

The study did not detail variations in size of property, layout of multi storey development or construction type. These factors all have an impact on infrastructure and installation costs and therefore the study must be seen solely as a comparative cost exercise. In seeking comparative cost analysis the study targeted developments where all three technologies had been evaluated, however electric heating was only considered to be a suitable option in some 75% of cases.

Average energy costs associated with lighting, running domestic appliances and cooking have all been derived from average energy consumption factors derived from the BREDEM model. The study conducted in late 2003 identified the following costs.

1. Capital Costs;
2. Annual Cost of Capital (Capital costs/Life expectancy);
3. Annual Servicing costs;
4. Annual Space Heat and Hot Water Energy Costs;
5. Annual Light and Appliance Energy Costs (Based on 2,595 kWh);
6. Annual Cooking Energy Costs (Based on 756 kWh);
7. Total Energy Costs per year; (4+5+6);
8. Running Costs (Energy Costs + Service Cost for Space Heating System);
9. Average Annual Overall Costs (Amortised Costs + Annual Running Costs).

4.3 Heating and Hot Water Provision

Results - The results of the study are summarised in Table 6 and Graphs 3,4 & 5 below.

Table 6 - Derived Average Heating and Hot Water Costs per Household

Technology	Capital Cost £	Life Expectancy Yrs	Annual Cost of Capital £	Servicing Cost £	Heating & Hot Water Cost £	Total Running Cost £	Total Annual Overall Cost £
Electric Heating	**1821**	**15**	**121**	**14.5***	**646**	**660.5**	**781.5**
Central Boilers	**4609**	**25**	**184**	**63.0****	**331**	**394.0**	**578.0**
CHP	**5039**	**25**	**202**	**105*****	**250**	**355.0**	**557.0**

* Based on 2% risk of breakdown: - 7 units per property equates to one visit every 7 years @ £100/visit

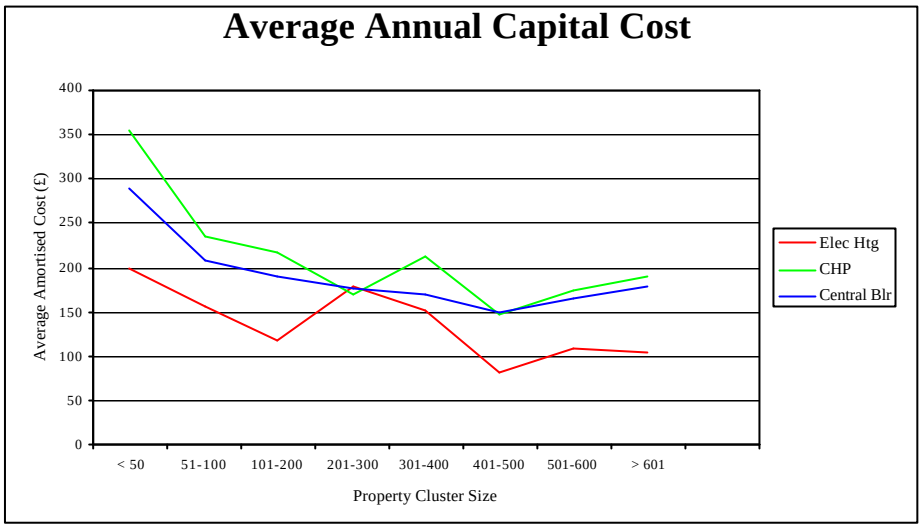
** Based on 0.9p/kw output. (Size of unit only has a marginal impact on cost)

*** Based on 1.5p/kw output. (Size of unit only has a marginal impact on cost)

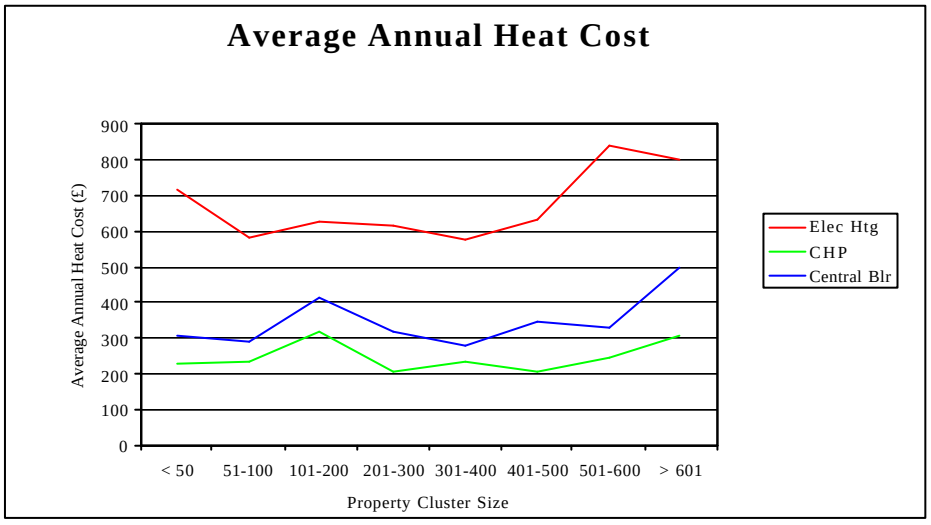
Electrical heating is by far the cheapest option from a capital and servicing perspective however this advantage is more than offset by the considerably cheaper heat and hot water derived from gas fired central boilers and CHP. When compared to boilers the cheaper heat generated by CHP is a function of the additional revenue stream from the sale of electricity. In terms of overall cost there is little to choose between centralised boilers and CHP. The long life expectancy of CHP and central boilers clearly has an impact on the annual cost of capital however in terms of sensitivity analysis even a downward shift to 20 years for these technologies would only impact annual overall costs by £50 and £46 respectively

The following Graphs highlight the heating and hot water costs associated with different sized clusters. Some of the cluster categories are represented by only one representative development and this small sample may explain some of the anomalous peaks.

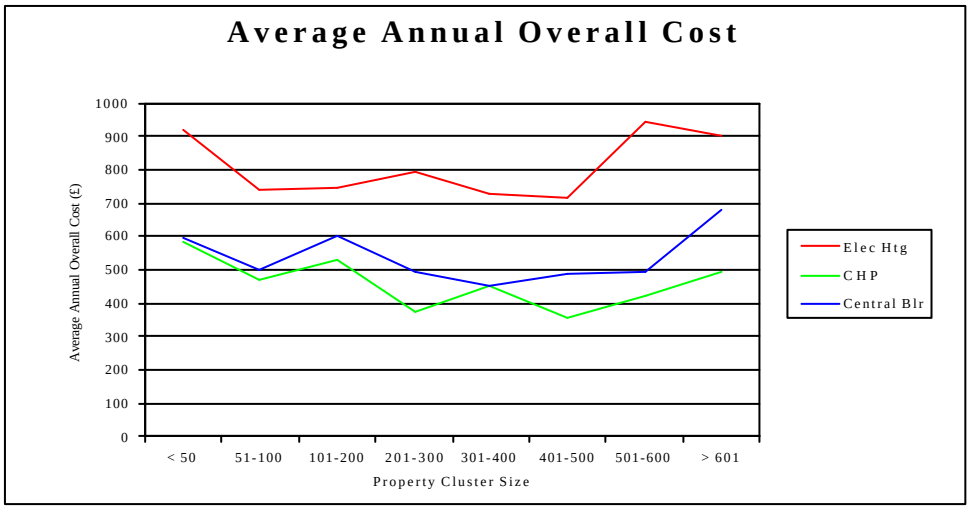
Graph 3 – Average Annual Capital Cost



Graph 4 – Average Annual Heat Cost



Graph 5 – Average Annual Overall Cost



4.4 Impact on Current Understanding

The study on tower blocks concluded that for this type of flatted unit the cost of night storage heaters was significantly higher than those specified in the Energy Savings Trust (EST's) Best Practice report. EST commissioned a study with BRE (Building research Establishment) to investigate the discrepancy and confirmed the DDU's figures.

4.5 Energy White Paper Implications

This study also highlighted a potential White Paper impact. Electric Storage Heaters and other electric heating systems based on low cost off-peak electricity were introduced into the UK market in the 1970's in order to make better use of the guaranteed base-load produced by the then new nuclear power stations. The White Paper strategic decision regarding the short to medium term future of nuclear power means that the supply of base load electricity from nuclear power stations will be phased out in time. Renewables may have the capacity to make up some of the shortfall for some of the time and there is capacity to import base-load nuclear generated electricity from France. Notwithstanding the future availability of off-peak electricity and the magnitude of price discount, currently 59%, has to be in question.

4.6 Heat Pumps

As part of the DDU's renewable activities working with partners including EDF Energy an ASHP has been installed in a top floor flat in a tower block in Newham. This unit's performance will be studied in detail for 12 months with a view to assessing the technologies suitability for use in multi storey developments.

5. Work-stream 5 - Energy Scenario Assessments

The development of an effective programme of sustainable energy management should ensure that all energy-based activities that have significant social, environmental and/or economic implications are identified and evaluated.

Government adopts a rigorous preventative approach to all round environmental management and requires as a pre-requisite, detailed information on the environmental implications of environmentally significant projects and activities. This regulatory approach to *Environmental Assessment* establishes, as an integral part of the formal planning process, a set of procedures designed to supply comprehensive information about a development or activity and how the environmental implications have been addressed.

The DDU in evaluating *Environmental Assessments* for new community development and proposals for regeneration projects is not convinced that the same rigour is consistently applied to the social, environmental and/or economic aspects of energy provision and use and more significantly to the evaluation of options or alternatives.

The DDU is of the view that energy issues should be firmly integrated into development planning and balanced within the whole decision making process. What is not needed however is yet another regulatory requirement that introduces prescribed rules directed

towards voluminous descriptive reports that contribute little to development planning and much to delay. What is required is recognition of the value of assessing the life-cycle sustainability implications of a range of fuel, energy and technology options.

For this reason the DDU is seeking to develop a new approach to evaluating the energy implications of a development. The approach with the working title Energy Scenario Assessment (ESA) advocates a move away from prescription that simply reinforces the *status quo* to a technique that is characterised by flexibility in content, applicability and methods and a mutual recognition by developers and authorities of the inherent value of such an approach. Notwithstanding the guiding principal of all ESA's is that they should contain sufficient information and data to allow the judgements and predictions made to be transparent.

The term ESA is used to describe the central concept and philosophy of assessing the life cycle implications of fuel, energy and technology choices for a community and the social, environmental and economic costs and benefits of those activities.

For the purpose of the working document the DDU has defined ESA as:

"A systematic process which provides a framework for gathering and documenting information and views regarding the energy options for a defined community and their social, environmental and economic consequences"

The main objectives of an ESA would be to:

- Quantitatively evaluate the energy needs of a defined community
- Predict the significant environmental, social and economic effects of the established or proposed base case
- Assess alternative fuel, energy and technology options
- Propose changes that will lead to a maximisation of positive effects and a minimisation of adverse impacts

Above all ESA is seen by the DDU as an iterative process that balances the sustainability tripod of social, environmental and economic energy considerations against other design construction and operational priorities.

To meet these objectives it is envisaged that an ESA will:

- describe the community and energy needs;
- characterise significant national, regional and environmental sensitivities in relation to energy aspects of the project;
- evaluate alternative energy scenarios for the community;
- identify the immediate, long term and residual social, environmental and economic benefits, costs and risk for alternatives considered;
- determine whether an acceptable balance exists between the social, environmental and economic factors;
- recognise the dynamic nature of the regulatory situation and energy markets and assist developers and planners to achieve an acceptable sustainability performance in the medium term; and

- provide information to relevant authorities and the public on the nature of the activity and its potential social, environmental and economic costs and benefits.

The ESA will we trust be a systematic process that will provide a framework for gathering and documenting information and views regarding the energy options and the social, environmental and economic consequences of different energy options for a defined community.

ESA should be a valuable activity:

- in the design of new communities;
- in the evaluation of options for established communities during regeneration or housing renewal activities;
- to address integrated opportunities for expanding communities; and
- evaluating the cost effectiveness of a range of retrofit solutions for established communities.

The DDU is currently completing its design of the approach and will seek an appropriate development to act as a demonstrator early 2006.

6. Work-Stream 6 - Fuel Poverty: Improved Targeting and Integration

The DDU sees finding and targeting the fuel poor as the single most difficult step in eradicating fuel poverty. Existing schemes do not systematically seek out the fuel poor neither do they provide all the measures necessary to eradicate fuel poverty. Paradoxically a significant number of households that qualify for support under conventional programmes are not in fuel poverty, while a proportion of those who are, for various reasons are excluded.

The NAO on Warm Front in June 2003 found that "around a third of fuel poor may be ineligible and two thirds of eligible households may not be fuel poor". DDU analysis of preliminary data from the Stockton warm zone, with a sample of 8,589 fuel poor households, shows these figures to be an underestimate. The analysis showed that 60% of the fuel poor in Stockton did not qualify for Warm Front, and of those eligible for Warm Front 75% were not fuel poor.

In early 2004 the DDU produced a think piece that challenged the conventional approach to delivering EEC and the Warm Front programme. It outlined a radical new integrated model and highlighted the potential cost effectiveness of a regional delivery model that both targets the areas where the fuel poor may be clustered and looks at the impact of integrating European, national, regional and local funding sources.

The paper draws primarily on the experience of the Transco Affordable Warmth's managed Stockton Warm Zone, which was the most effective of the first tranche of Zones, and on the spin-off Redcar and Newcastle Zones. In setting out the impact of other funding streams on fuel poverty, the paper considered the way in which these resources are secured and targeted, and how they interact with the "mainstream" fuel poverty programmes.

The paper based its strategy on a systematic local approach, focusing on wards with a high IMD. The paper concluded that this approach represented a more useful, more cost effective way forward, in terms of identifying much more cheaply fuel poor households and providing resources for them all to be helped, regardless of benefits status.

The key messages from the DDU's work were:

- A strong correlation exists between measured Fuel Poverty and the Index of Multiple Deprivation.
- If this correlation is reflected across all English wards it would imply that over 80% of fuel poor households are in 33% of the wards.
- The costs of finding and delivering the full range of hard and soft measures to the fuel poor in wards with a deprivation index >25 in Stockton was £45.54.
- The total cost of targeting this spend at the most deprived wards and working systematically to find the fuel poor would be some £52 million.
- Depending on circumstance, significant additional funding can be made available from a number of sources.
- It is difficult to assess how widely applicable this would be across the country. But the encouragement of comprehensive regionally based targeted projects would appear to offer the best chance of levering in additional funds.
- In such an approach these additional funds are critical to helping the substantial number of fuel poor who are outside the benefits based scheme.
- The local community approach should substantially reduce the costs of identifying, surveying and helping the fuel poor, particularly if there were a focus on deprived wards.

6.1 Data used in the study

The most complete data on homes treated relates to Stockton, as set out below:

Total priority EEC and fuel poor -	19,127
Warm Front eligible -	13,983
WF/priority EEC eligible but not fuel poor -	10,538
Fuel poor as defined -	8,589
Of whom WF eligible -	3,445
EEC priority eligible	2,260
Fuel Poor not eligible for EEC priority or Warm Front	2,884

This shows that

- 60% of fuel poor in Stockton are not eligible for warm front
- 34% of Fuel Poor in Stockton are not eligible for warm front or priority EEC
- 25% of household qualifying for warm front are fuel poor
- 55% of those eligible for priority EEC or Warm Front are not actually fuel poor

A third of those defined as fuel poor in terms of income/ energy expenditure ratio are not eligible for help under either of the mainstream programmes, and could not have been helped at all without the additional funding sources mentioned above.

6.2 Integrated Funding

The Warm Zones have been successful in linking a range of funds:

- Neighbourhood Renewal*: used to provide measures for those fuel poor households who don't qualify for free measures under "mainstream" programmes.*

- Single Regeneration Budget*: used as for NR funds.*

- European Regional Development Fund*: primarily for central heating systems for non-qualifying households in objective 2 wards;*

- European Social Fund*: primarily for training and paying for staff either working directly for the Zone or for local contractors.*

- Contribution from local Primary Care Trust*: for emergency spot installation of measures for non-qualifying households, in homes identified by outreach workers.*

- Local Authority Core Capital programme *Targeted at a range of non-qualifying households.*

- Contribution from Local RSLs: *savings from the efficient deployment of EEC measures in RSL housing is used to cross subsidise non qualifying and non-RSL housing.*

- Housing Market Renewal Pathfinder *potential funding from ODPM, aimed at kick-starting housing markets as an engine of regeneration.*

- ALMO funds from ODPM, *to improve thermal comfort in social housing*.

Some of these forms of funding require the money to be spent in very specific geographical areas; and, in the case of the European ones, to be matched by other funds as a condition of release. This militates for comprehensive and quite local schemes if these important sources of additional funds are to be accessed. The DDU recognised that Warm Front cannot be used to lever in European funding because – as constituted at present – there is no mechanism for allocating a tranche of it in this specific way. As shown in Redcar and Newcastle Warm Zone ERDF (European Regional Development Fund) money is available for measures, notably central heating systems, for fuel poor households in Objective 1&2 wards. There are 2,384 wards in England that qualify for funding under Objectives 1 and 2 of the ERDF.

6.3 Identifying the Fuel Poor

The Stockton Warm Zone experience suggested that comprehensive street-by-street, assessment, survey and treatment can provide a very efficient and cost effective means of identifying the fuel poor, including the significant number (whatever that number might actually be) who do not qualify for "mainstream" programmes. In Stockton, wards with a high IMD score (more than 23.2) contained a relatively low proportion of the housing

having 53% of the homes but a very high proportion (87%) of the fuel poor. The density of the targeted fuel poor 'audience' meant that the costs of identifying and helping fuel poor households was relatively low:

Costs

- cost per home visited (all homes) £ 8.50
- cost per home assisted (at least 1 measure) £12.85
- cost per fuel poor household assisted £66.46
- cost per fuel poor household assisted in wards with IMD score above 25. £45.54
- cost per fuel poor and EEC priority household assisted in wards with an IMD score above 25 £22.68

This compares with the figures for Warm Front nationally of roughly:

- cost per home assisted £115
- estimated cost per fuel poor recipient assisted £285-380.

The estimated cost per fuel poor Warm Front recipient assumes that the proportion of recipients who are fuel poor is in the range 30-40%.

It is hard to be sure to what extent the Stockton results are typical of England as a whole. But if the location of fuel poor households is typical, it suggests that over 80% of fuel poor households are in wards with an IMD of greater than 25: on this basis, using Stockton cost levels and average hit rates, systematic identification of about 1.2 million fuel poor households in the 2777 qualifying wards would cost about £55 million. A significant proportion of which could be funded from other programme sources. For example in the Newcastle warm zone 16% of total programme costs are from industry, 23% from the local authority, 23% from European Funds and 38% is from local companies.

In addition to identifying and delivering a full range of hard and soft measures to the 1.2 million fuel poor in the qualifying wards the same programme would (extrapolating from Stockton) identify 1.3 million EEC priority households that could have a full suite of insulation measures at negligible marginal cost.

The report recognised that to refocus Warm Front towards supporting a systematic localised approach, targeting wards with the greatest concentration of fuel poor, is not without problems – for example, there would need to be a mechanism for dealing with urgent cases in areas other than those in the immediate programme – but the efficiency savings in both surveying and installation could be significant. The DDU therefore continues to develop its thinking in this area.

Glossary of Terms

ASHP	Air Source Heat Pump
BRE	Building Research Establishment
CES Ltd	Community Energy Solutions Ltd
CHP	Combined Heat and Power
CIC	Community Interest Company
DEFRA	Department of Food and Rural Affairs
DDU	Design and Demonstration Unit
DTI	Department of Trade and Industry
DWP	Department of Work and Pensions
EEC	Energy Efficiency Commitment (2002-2005)
EEC 2	Energy Efficiency Commitment (2005 – 2008)
ERDF	European Regional Development Funds
ESA	Energy Scenario Assessment
EST	Energy Saving Trust
FPAG	Fuel Poverty Advisory Group
GSHP	Ground Source Heat Pump
iGT	Independent Gas Transporters
MDI / IMD	Multiple Deprivation Index / Index of Multiple Deprivation
NAO	National Audit Office
ODPM	Office of the Deputy Prime Minister
ONE	Regional Development Agency – One North East
PV	Photovoltaics
RDA	Regional Development Agency
SEPN	Sustainable Energy Policy Network

Stockton Warm Zone	One of 5 pilot programmes piloted by Government to provide a holistic solution to fuel poverty
Transco's AWP	Transco's Affordable Warmth Programme
Warm Front	Government's main programme for combating fuel poverty in England
Yorkshire Forward	Regional Development Agency – Yorkshire Forward