



Energy Efficiency Best Practice in Housing Community Heating – Aberdeen City Council Case Study



Introduction

This Case Study shows how Aberdeen City Council developed a strategic approach to community heating for existing property upgrades. It also shows how the feasibility and funding issues were addressed, and then sets out the lessons learnt.

The Study will be of special interest to local authorities and housing associations.

Aberdeen City Council

In 1999 Aberdeen City Council (ACC), which has some 26,500 properties, adopted a comprehensive Affordable Warmth Strategy. Since then ACC have upgraded a large proportion of their housing stock, at the same time meeting the obligations of the Home Energy Conservation Act (1995). The improvements were mainly in heating systems, building fabric and levels of insulation. They have made a positive contribution to achieving ACC's key objectives of affordability, sustainability, ensuring tenants' safety and reducing carbon dioxide emissions.

ACC's stock includes 59 multi-storey properties (4,800 units). Whilst the majority of the low-rise housing stock has been greatly improved through comprehensive upgrades, the multi-storey properties have proved much harder to tackle in energy efficiency terms. The options for high-rise properties are more limited with substantial implications for capital expense and disruption to tenants.

ACC also have low-rise sheltered housing (1,800 units) and amenity houses (1,500 units). Amenity houses offer self-contained accommodation with the minimal level of on-site support – normally likely to have an alarm system rather than any warden provision. Many are hard to treat or currently house people who are fuel poor. Consequently they were seen as a high priority by ACC.

The primary objectives for these properties were to achieve affordable warmth for tenants and reduce CO₂ emissions, in a way that could be afforded by the Council in capital terms. The initial task was to identify the most cost effective way of meeting these objectives.



In recent years the UK Government has begun to give active support to residential community heating developments, giving rise to increased levels of grant funding. As a result, community heating has become a more economically attractive option for local authorities.

ACC decided to commission and fund an initial feasibility study into multi-storey community heating with Combined Heat and Power (CHP) to see if this would be a suitable option for the multi-storey properties and how such a scheme would best be implemented.

Community Heating and Combined Heat and Power (CHP)

A Community Heating scheme is defined as one 'where more than one building or dwelling is heated from a central source'

When electricity is generated using conventional generation technology most of the energy in the fuel is lost as waste heat. CHP systems recover this waste heat which can be used for community heating in conjunction with centralised boilers. CHP thereby utilises fuel very efficiently, minimising the environmental impact and leading to very low heat production costs.

Initial Investigation into Community Heating with CHP

In October 2000 a feasibility report was produced by an independent CHP consultant, which examined in detail the main issues for consideration. The aim was to establish what level of funding would be available to ACC and to provide a report to present to the committee. The report also explored the feasibility of a suitable group of multi-storey properties for a potential scheme. This group of properties comprised 7 multi-storey blocks of flats in the **Seaton** area of the city.

These properties were chosen because: (1) they were close together, reducing the capital expenditure necessary for distribution systems, and (2) their existing warm-air electric heating systems would be due for upgrade in the near future. There were also 7 additional blocks of flats nearby which would enable the scheme to be extended at a later date.

One of the recommendations of the report was the creation of a 'not-for-profit' organisation to fulfil the financing requirements for the heating of the multi-storey stock. This would enable ACC to meet their affordable warmth targets much earlier than would be possible under existing Council arrangements.

Whilst this initial report was used to gauge the likely funding for such a scheme, more detailed surveys were undertaken of the multi-storey, sheltered and amenity housing stock. The aim was to: (1) develop a practical long-term housing strategy for ACC, and (2) establish the most appropriate properties to incorporate community heating.

Multi-storey and Sheltered Housing Feasibility and Energy Study

To achieve its objectives ACC needed to gain a clearer picture of the current condition of its 8,100 properties. A team of consultants; engineers, architects and quantity surveyors, was commissioned and funded by ACC to carry out this study.

The properties were divided into groups by type, and a typical building of each type was selected for further investigation. This allowed options to be considered for all buildings whilst minimising the costs of the study. The sample included 15 high-rise blocks, 12 low-rise sheltered blocks and 24 of the 1 and 2 bedroom houses.

Additional examination of these properties included a full structural survey, a ground condition survey and an energy audit. The purpose was to gather data relating to current building defects and to estimate the remaining life span of the building components.

From the initial surveys of all the buildings an understanding of total costs for repair, maintenance and like-for-like replacement over a 30-year period was established. This provided a useful datum for the appraisal of potential options (see Table 1).

In addition to the individual building assessment, an appraisal was made of buildings in close proximity to each other. This would allow consideration of connecting buildings to a centralised heating plant if they were close enough together to form a heat network. Such a group of closely related buildings is called a cluster.

The consultants produced an original plan of 59 clusters which, following further consultation with ACC, was reduced to 35. The other 24 were considered inappropriate due to scale, geographic location and inherent infrastructure connection problems.

Table 1: Projected costs for maintenance and repair of existing (8,100 units) properties over a 30 year period

Years	5-yearly costs in £ millions						Total
	1-5	5-10	10-15	15-20	20-25	25-30	
Building costs	212.3	42.4	44.0	47.6	37.0	40.3	423.5
Mechanical & Electrical costs	38.6	10.1	9.2	9.5	15	11.3	93.9
Total	250.8	52.5	53.2	52.1	52.0	51.6	517.3

The report identified one of the 35 clusters as the most appropriate for the development of a CHP scheme. This cluster, **Stockethill**, comprises 288 flats, in 4 multi-storey blocks. The flats had electric storage heating, which had been installed in the 1970's. 70% of the residents of these dwellings were estimated to be in fuel poverty. The tenure of these properties was 98% council tenants and 2% owners.

The dwellings, with their existing electric heating, had an average National Home Energy Rating (NHER) of 3.3. This is a very poor rating.

All potentially viable upgrading options were considered. The options in Table 2 were considered in more detail, their effects evaluated and the NHER calculated. The NHER was not, however, taken as the only criterion.

The predicted running costs and CO₂ emissions were also calculated and considered when selecting the most effective option.

Table 2 shows that the most attractive option was CHP with overcladding of the buildings. However, overcladding would have been prohibitively expensive in capital terms for ACC. Instead they decided to opt for CHP only. This would improve the NHER to 6.0, reduce tenant heat costs by about 40% and reduce CO₂ emissions by about 40%.

Table 2: Appraisal of options

Option	Average NHER	% Reduction of NHER	Total capital cost £	25 Year whole life cost	Estimated running cost/ week/ flat £	% Reduction in estimated running costs	Total CO ₂ emmsions (tonnes/annum)	% reduction in CO ₂ emmsions
Existing heating systems	3.3	N/A	N/A	N/A	5.23	N/A	1597	N/A
Upgrading electrical unit heaters (no cladding)	3.3	0	780,000	2,680,000	5.23	0	1581	1
Upgrading electrical unit heaters (cladding applied)	4.5	25	1,570,000	3,317,745	4.47	14.5	1282	20
Centralised boiler plant (no cladding)	6.5	49	935,000	2,275,589	4.15	20.5	1007	37
Centralised boiler plant (cladding applied)	7.5	56	1,630,000	2,932,540	3.93	25	837	48
CHP scheme (no cladding)	6.0	44	1,530,000	1,896,956	3.20	39	936	42
CHP scheme (cladding applied)	6.9	52	2,250,000	2,658,854	2.75	47.5	794	50

Financing the Scheme

Having established how best (technically and operationally) to upgrade the 4 multi-storey blocks in Stockethill, ACC needed to determine how they could finance the scheme.

Like all community heating schemes, the initial capital costs were relatively high. Without external funding ACC could only afford to fund one such scheme every 10 to 12 years - and yet 59 tower blocks needed upgrading!

From the initial feasibility report it was recommended that ACC set up a separate 'not-for-profit' company to develop and manage CHP schemes across Aberdeen.

The most appropriate structure for this company was identified by ACC staff from a number of departments. A legal agreement between ACC and the company Aberdeen Heat and Power Limited (AH&P) was then drawn up. This commits ACC to provide funding of £215,000 per year to AH&P to ensure that any bank loan taken out for capital costs can be repaid (see Table 3)

The Board of AH&P consists of ACC representatives, tenant representatives and up to 6 unpaid independent directors with varied and relevant expertise. ACC have made it a requirement of the agreement that ACC provide a full range of financial services for AH&P, on a contract basis, during the first few years. This will give AH&P a strong start and ensure that correct financial procedures are established.

A business plan and cash flow forecast were also produced. It is intended that any surplus funds generated by AH&P will provide capital to start work on the subsequent cluster of properties.

The separate company arrangement benefits ACC in many ways: it facilitates capital investment in the stock, accelerating the refurbishment programme and spreading the capital cost over several years.

ACC successfully applied to the Community Energy programme for grant funding. This is available for up to 40% of the capital costs. For more information on the current process and criteria of the Community Energy programme see contact details at the back of this publication.

Due to the annual contribution of ACC, AH&P were successful in securing a favourable rate of interest for a bank loan to cover the remaining 60% of the capital. ACC are also accessing Energy Efficiency Commitment (EEC) money. This is the first scheme to be receiving a Community Energy programme grant.

Clearly ACC has had to ensure long term security of the tenants' heating supply. They had to consider what would happen if AH&P were to cease trading.

The land on which the energy centre was built, and which contains the distribution network, is owned by ACC. Should AH&P cease to trade, under Scottish Law, their assets would revert to whoever owns the land, i.e. ACC. Also, as the loan that AH&P took out to finance the development was underwritten / guaranteed by ACC, the outstanding loan repayments would revert to ACC; there would be no other major claim on the assets by any outside body.

Implementation

Having secured the Community Energy Programme funding, applied for planning permission and carried out the full tendering process, the Stockethill scheme was able to go ahead.

An energy centre was built close to one of the 4 multi-storey blocks. It houses a 210kWe gas fired reciprocating engine CHP unit and 2 x 700kW [thermal] gas fired boilers for peak load and back-up.

The heat is distributed to the 4 blocks via pre-insulated underground pipes, which comprise the heat network, with each unit having a new internal distribution system.

It is anticipated that 47% of the electricity produced by the CHP unit will be sold to dwellings served by the heat network - with the remainder being sold to other customers.

The heating system arrangement for each dwelling is the same as a conventional central heating system, apart from the absence of individual boilers.

Mechanical heat recovery ventilation units were considered but rejected due to the excessive disruption to tenants which would be caused by the need to remove most of the kitchen fittings.

Community heating from a central plant can keep maintenance costs down - no individual gas safety certificates need to be produced or servicing carried out; therefore fewer visits are required to individual properties.

ACC consulted with their tenants throughout. As the process was an improvement, rather than a repair, the tenants were able to choose whether or not to have the new heating installed.

Table 3: Total Project cost = £1.6 m

Grant / loan / contribution	Amount	Source
Grant - set up funding	£50,500 (50% set-up costs)	Energy Services Programme Set-up funding
Grant - capital costs :	£659,600 (40% capital costs)	Community Energy (EST)
<ul style="list-style-type: none"> • CHP plant • Distribution system • Internals 		
Loan	Up to £1m based on capital contribution of ACC of:	Bank financing
Contribution to Aberdeen Heat and Power	£215,000 per annum	ACC
As yet unconfirmed		EEC

Of the 288 flats, 21 tenants did not want the system. Most of the refusals were from tenants suffering from ill health concerned about disturbance. They would be given the opportunity to change their minds towards the end of the contract period. Flats without the system would have it installed once the property becomes void.

Tenants were asked how they would like to pay for their heating and hot water. The vast majority voted for a flat rate weekly charge which will be paid through heat-with-rent. ACC held back on installing the new heating system in 5 flats with a high level of rent debt. The heat-with-rent method could have worsened the debt situation. It was decided that these cases would be kept under constant review and, once individual solutions to the debt problem were found (even if the debt was not cleared), the heating system would be installed.

Whilst the flats' heat use is not individually metered, ACC have placed great emphasis on providing fully controllable heating systems and individual face-to-face energy efficiency advice, including how best to use the heating system. ACC hope that this will encourage tenants not to waste energy. ACC have commissioned the CHP consultant to monitor the actual use of heat and compare it with another similar scheme where heat is individually metered, to see if there is a significant difference.

It is interesting to note that by not having individual meters and charging by heat-with-rent the heating charge is exempt from VAT, helping to keep down the tenants' costs.

In December 2003, a supply of heat was delivered to the first property. AH&P will be charging ACC £4.25 per flat per week for the heating. ACC want to be sure that they will be able to meet all of those from tenants. Taking account of possible bad debts, voids and that tenants only pay rent for 48 weeks of the year, ACC have decided to charge the tenants £4.75 per week. This charge will be reviewed annually to reflect actual use, debts, voids and surplus or shortfall from the previous year.

AH&P also operate a Code of Practice for services to its customers as is currently required of any direct energy supplier.

Issues for Owners

In Stockethill there are only 6 owners. They were consulted throughout the process and all agreed to have the heating system installed. Their main concerns regarding the upgrade of their heating systems were the capital cost and the possibility of large maintenance bills in the future.

To alleviate these concerns ACC are charging them a weekly flat rate of 50p towards long-term maintenance costs. ACC also offered the leaseholders a loan to cover the cost of installation - the repayments being lower than their actual saving in heating costs.

There is also the benefit that ACC still 'own' the heating systems. Should any of the other properties be sold under the right to buy there will not be any problems with a 'clean title'.



Lessons learnt so far

From this entire process the main lessons that ACC have learnt are:

- The need to approach the process strategically
- Whole life costing is the best way to establish the real cost and Best Value
- External specialist assistance is essential
- Due to the development workload it is advisable to delegate an individual to champion the project and keep it moving
- An arm's length company arrangement enables acceleration of refurbishment plans

The Future

AH&P are already looking towards the next set of clusters as recommended in the original feasibility and energy study for the development of CHP. With the company now set up 'for the benefit of the people of Aberdeen' to develop and manage CHP schemes, AH&P will continue to reduce CO₂ emissions and address fuel poverty issues across the city. ACC Community Services staff will also continue to play an important role in identifying future projects in line with regeneration plans.

ACC have applied for a 50% grant towards a feasibility study from the Community Energy Programme for the next cluster. This is the Seaton area scheme, which was used in the initial feasibility study back in 2000.

This scheme will also include a primary school and the potential to link with University buildings and a leisure complex.

For each subsequent CHP development ACC will draw up a new legal agreement with AH&P in respect of the housing element of the development. This enables ACC to keep the Housing Revenue Account funding separate from other Council budgets. If AH&P succeed in incorporating other non-domestic council buildings into a CHP scheme, a separate legal agreement will also be drawn up.



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Further Reading

Energy Efficiency Best Practice in Housing

These publications are available from

www.est.org.uk/bestpractice -

or phone the helpline on **0845 120 7799**

BedZED, Beddington zero energy development, Sutton (GIR089)

Benefits of best practice: community heating (CE13)

Community heating- a guide for housing professionals (CE55)

Community heating in Nottingham – an overview (GPCS 312)

Community heating in Nottingham - domestic refurbishment (GPCS 313)

Community heating in Nottingham – pipework refurbishment (GPCS 314)

Community heating serves luxury private apartments (GPCS 400)

Domestic heating and hot water – choice of fuel and system type (CE49)

Opportunities for electricity sales to tenants from residential CHP schemes (NPP112)

Selling CHP electricity to tenants – opportunities for social housing landlords (NPR113)

Action Energy

Action Energy also produce the following publications, which are available from www.actionenergy.org.uk or the helpline on **0800 58 57 94**

CHP opportunities for local authorities (GPG322)

Energy services PPP/PFI projects for community heating (NPP123)

Guide to community heating and CHP – commercial; public and domestic applications (GPG234)

Energy Efficiency Best Practice in Housing

Helpline: 0845 120 7799

Fax: 0845 120 7789

Email: bestpractice@est.co.uk

Web: www.est.org.uk/bestpractice

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Small-scale combined heat and power for buildings (GPG176)

The manager's guide to packaged combined heat and power systems (GIR082)

The use of combined heat and power in community heating schemes – four case studies (GPCS370)

Using the PFI for the upgrade and extension of community heating (NPR123)

Further Information

Combined Heat and Power Association

Grosvenor Gardens House,

35-37 Grosvenor Gardens, London SW1W 0BS

Tel 0207 828 4077 Fax 0207 828 0310

<http://www.chpa.co.uk/>

E-mail: info@chpa.co.uk

Community Energy Programme

The Community Energy Programme provides guidance and funding for the refurbishment of existing and installation of new community heating schemes in the public sector across the UK. The programme has £50 million available over 2002-2004 for **capital** and **development** grant funding. The programme is managed by the Energy Saving Trust and the Carbon Trust, and works closely with industry through the relevant trade bodies (CHPA and others).

For further information, or to obtain a copy of the Financing Community Energy Schemes publication, visit www.est.co.uk/communityenergy or telephone **0870 850 6085**

