Energy Ratings and Affordability in Social Housing in Scotland and Northern Ireland

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1. Background

Social housing is key to achieving the targets of eliminating fuel poverty set out in the UK Fuel Poverty Strategy (2001) and Action Plan (2004). Housing managers need to have clear policies and strategies in place to bring the energy efficiency of their housing stock up to a level that will ensure that homes are affordable for tenants.

The work described in this report will allow social landlords to set energy efficiency and affordability targets, and to develop an annual reporting mechanism to demonstrate progress towards the elimination of fuel poverty. It builds on similar work for England and Wales entitled "SAP targets and Affordability in Social Housing[1]" and much of the discussion and technical detail in that report, particularly the appendices, is directly relevant and may be read as useful background information.

2. Executive Summary

Setting standards for social housing using energy ratings like NHER or SAP offers a number of advantages. They are already part of the reporting regime for local authorities and housing associations. Accurate individual SAP ratings will be needed as part of the Energy Performance Certificate from 2008/2009. All that is needed in addition is a mechanism for reporting on the numbers or percentage of homes that are below the level needed for affordability.

The model proposed here suggests recommended and minimum SAP and NHER standards based on different household types and regional variations in climate. Being relatively simple to introduce, administer and explain it offers housing managers a way to identify and quantify the problem of fuel poverty and to ensure the right measures are put in place to combat it effectively.

Recommendations for improving accuracy are discussed where only low level data are available.

Recent increases in the price of domestic fuel are clearly an important factor in the design of targets. Fuel prices used in the SAP calculation are normally fixed for 3 to 4 years. For Scotland, a simple mechanism is proposed to allow for some interim fluctuation in prices.

For Northern Ireland the situation is considerably more complex, and the problem more acute, due to a very different pricing regime. The case for standards and target setting is arguably even stronger here.

In the short to medium term, the effect of high fuel prices relative to incomes means that energy efficiency improvements alone cannot deliver affordability and some form of fiscal response should be considered. This is particularly relevant to Northern Ireland where fuel poverty is more likely to be due to high fuel prices and low incomes.

[1] Wilkinson, B. (2006) available from www.eaga.com/downloads/eagapct/finaleagactreport_saptargets_finalversion1.pdf

3. Recommendations

To Social Housing Providers:

a. Affordability targets[2] based on SAP or NHER should be set by all social landlords as follows:

Location Band	Scotland A	Scotland B	Scotland C	Scotland D	Northern Ireland
Recommended SAP	76	78	80	83	93
Minimum SAP	61	63	66	69	80

Key: A: West and South West; B: Borders, East, Highlands, Western Isles; C: Orkney and North East; D: Shetland

b. Timescales and action plans to achieve the targets should form part of an affordable warmth strategy. Annual reporting should detail the properties that are not affordable. Additional responses, such as social tariffs, should be considered in the event that properties with below minimum SAPs are let to tenants on housing benefit.

c. Targets should be reviewed annually in the light of changing fuel prices.

To the Scottish Executive

d. The existing NHER and SAP standards, forming part of the Scottish Housing Quality Standard, should be revised as they are now too low, as a result of fuel price increases in the last three years.

To the Northern Ireland Housing Executive

e. A programme to assemble SAP ratings on individual dwellings should be started in order to identify lower scoring properties and a system of annual reporting instituted, to monitor improvement in the average SAP and numbers of those below the target.

To the UK Government

f. Recent rapid increases in fuel prices have made it very difficult to achieve affordability in some types of social housing. In the longer term more expensive types of improvement, such as solid wall insulation, will be necessary and in some cases a substantial increase in incomes may be needed.

g. As a short term solution to rising fuel prices central government should consider financially compensating low income tenants, using the SAP rating to determine the level of compensation. This can be done on a sliding scale using fuel vouchers to pay part of the fuel bill.

[2] Adjusted for location, see page 10

4. Introduction – the case for targets

The UK Fuel Poverty Strategy (2001) and Action Plan (2004) set target dates for the elimination of fuel poverty, as required by the Warm Homes and Energy Conservation Act 2000: 2010 for vulnerable households, and 2016 for non-vulnerable private sector households. Work by social housing providers to bring the standard of their housing stocks up to that envisaged by the Decent Homes Act and the Scottish Housing Quality Standard (SHQS) was expected to play a major part in achieving the Government's overall aspiration.

If this is to be achieved, housing authorities and managers need practical ways to identify, quantify and approach the problem in their housing stocks. Fuel poverty, as has been noted before, is a moving target since household circumstances change, people move home, and incomes vary in relation to fuel costs. A simple, targeted approach is needed to assist managers to better plan, prioritise and allocate resources to improvement works and to be clear about outcomes in terms of the improved affordability of homes, provided they have a way to assess their affordability in the first place.

In many cases such an approach can be developed from existing practice with relatively small changes.

Firstly we propose that, since it remains the case that the majority of social housing tenants are on low incomes, *all* social sector properties should be affordable, not just those that happen to be occupied by low income households at a particular point in time. Any other sort of approach is likely to lead to resources being used inefficiently first to identify those households at risk, then to carry out improvements in a sporadic way and finally to evaluate the long term effects of those improvements on levels of fuel poverty.

Next we suggest that targets that make use of energy rating systems represent a straightforward and sensible way forward. Again these provide a scoring mechanism that is easy to understand, can be "future proofed" and make use of data that can be routinely collected. Targets based on energy ratings have the additional benefit of being relatively sophisticated if needed, allowing for very detailed analysis to support policy decisions and resource allocation.

This type of strategy has been adopted by a number of authorities and housing associations. In particular is has been the approach taken for some years by Newark and Sherwood District Council with great success and described in our article "SAP targets and affordability"[3].

This report explains the basis of the strategy and its application in the social housing context in Scotland and Northern Ireland.

5. Defining fuel poverty

The UK Strategy takes the standard approach to this question, defining a household in fuel poverty as one that would need to spend more than 10% of its income on energy costs in order to maintain satisfactory standards of

[3] Pickles, D. and Wilkinson, B. (2005), *Energy Action*, Issue 96, pp 18-19, N.E.A.

warmth[4]. However income is defined in two ways. The "full income" definition includes any housing benefit paid to meet rent payments or income support for mortgage interest (ISMI). The "basic income" definition, used by most professionals working in the fuel poverty field, excludes housing benefit or ISMI. Average Rent levels are highest in London, and are larger in RSLs when compared to local authority housing. Based on the "full income" definition, the income of a social housing tenant would be around £3-£4,500 pa higher using average rent levels in 2005 for a 3 bed property[5].

Estimates based on the "full income" definition suggest significantly lower numbers in fuel poverty and it is the Government's preferred definition for target setting. However it results in some glaring anomalies. For instance the inclusion of housing benefit as part of assumed income means that households are effectively removed from fuel poverty if their rent is increased sufficiently. Identically constituted households, living in identical houses, with the same running costs but different rent levels, may or may not be in fuel poverty.

In practical terms a strategy that overly concerns itself with real incomes is not really helpful. Accurate information about tenants' incomes is extremely difficult to come by, particularly given data protection considerations, and even more difficult to keep up to date.

The simple approach recommended here relates affordability to the basic income definition for fuel poverty, and running costs to the dwelling's SAP or NHER rating. It suggests targets for affordability based on basic minimum income levels of vulnerable households. Non-vulnerable households (those under 60, able to work and without children) are less likely to have permanently low incomes, and are more likely to be living in smaller properties with lower running costs. The basic *minimum* incomes for this group are much lower however, and SAP targets of the level necessary to eradicate the risk of fuel poverty for this group would be very difficult to achieve in existing housing. Another form of response may therefore be necessary to address the residual level of risk amongst this group.

6. Measuring performance in social housing - standards and targets in the devolved administrations

In the case of new social housing in **England** there have been minimum standards of energy efficiency for some years. Originally the Housing Corporation set minimum SAP[6] ratings for new housing and refurbishment schemes, based on unit floor areas. These were replaced by Carbon Index standards when the Building Regulations changed in 2002.

For existing housing in **England and Wales**, warmth or "a reasonable degree of thermal comfort" is a key criterion under the Decent Homes Act 2000. The Government's aim is that all local authority and housing association housing will comply with Decent Homes criteria by 2010 and that conditions for vulnerable households in the private sector will have been improved by

[4] Department of Trade and Industry (DTI) / Department for Environment, Food and Rural Affairs (Defra), (2001), *The UK Fuel Poverty Strategy,* The Stationery Office
[5] http://www.dataspring.org.uk
[6] Housing Corporation, *Scheme Development Standards* (1995)

means of local authority private sector housing renewal strategies. The thermal comfort criterion has been criticised for its lack of a clear performance standard, although very recent guidance for the Housing Health and Safety Rating System (HHSRS) suggests that a SAP rating of less than 35 should be regarded as a category one hazard, leading to a Decent Homes failure[7]. Authorities are required to report annually on the proportion of non-decent homes amongst their own stock, and the percentage improvement on the previous year's performance.

Northern Ireland adopted the Decent Homes standard in 2004. Decent homes failures are mainly on the thermal comfort standard. In 2004, 31% of NIHE homes were non decent (likely to be under 20% in 2006[8]), of which 97% included failure on the thermal comfort standard. The majority of these related to solid fuel heating which is less controllable than gas or oil heating.

In **Wales**, the National Assembly has set SAP standards for social housing related to floor areas[9]: For a home of 80m^2 the target is a SAP of 65 (calculated under SAP 98, not SAP 2001).

In **Scotland** the Executive has adopted an NHER of 5.0 or a SAP of 50 as part of the Scottish Housing Quality Standard to be achieved by 2015, with a proviso that a SAP of 60 is applicable for homes without gas heating.

A SAP target of 65 to be achieved "wherever practicable" has been used in the English Warm Front Programme since June 2005.

Though there is no specific minimum standard for local authority housing in **England**, in 2000 the guidance to local authorities on reporting of fuel poverty under the Home Energy Conservation Act suggested: *"…they might want to develop an indicator that said, for example, that all authority-owned housing with a SAP of less than "x" would be improved to at least "y" within 5 years."* All social landlords have for a number of years been required to report the *average* SAP of individual housing stocks, as Best Value Performance Indicator 63 for Local Authorities and in the Regulatory Statistical Return for Housing Associations.

For fuel poverty the average is much less important than the numbers of homes with low SAP ratings. For private sector housing (this does not include housing association stock), in their statistical return for the Housing Investment Programme, local authorities are required to provide the average SAP, together with the percentage of homes with a SAP below 35 (previously 30), or the SAP of the lowest quartile.

In **Scotland** the Standard Delivery Plan requires all social landlords to report on progress towards meeting the SHQS, including the standard NHER or SAP. In **Northern Ireland** at the present time SAP ratings are not routinely calculated for individual dwellings except for Building Regulations purposes.

[7] Department for Communities and Local Government (DCLG) (2006), *A Decent Home: Definition and Guidance for Implementation*, available from www.communities.gov.uk
[8] Noel Rice, NIHE (personal communication)
[9] Based on SAP 98

What is SAP?

The SAP (Standard Assessment Procedure) was developed by BRE in 1993 to unify the existing rating systems of Starpoint and National Home Energy Rating (NHER), which had been in use since 1990. The Starpoint system has now been discontinued, to be replaced by SAP, though NHER continues, and is intended to provide a more accurate assessment of total running costs. The NHER is on a scale from 0 to 10, and for most homes is very roughly equivalent to the SAP divided by 10.

SAP is an estimate of the cost of space and water heating and the electricity in central heating (needed for fans and pumps) per m^2, under specified conditions. The cost is scaled by floor area so that the SAP for different sized, but otherwise similar homes is essentially the same. SAP has been used in Building Regulations since 1996, with a legal requirement since 2000, largely ignored, to display the SAP rating in new homes for sale or rent.

The SAP calculation is periodically reviewed and updated and new versions were issued in1999 (SAP 98) and 2002 (SAP 2001). SAP 2005 (issued in 2006 to coincide with new Building Regulations) is a very comprehensive update that incorporates changes required by the EU Directive on the energy performance of buildings 2002/91/EC (EPBD), and provides a simplified route to demonstrating compliance with the new Part L1A.

The main change to the new SAP (2005) version is a move from the current 1 to 120 scale, to a 1 to 100 scale. A home scoring 100 on the new scale will have essentially no running costs for space, water heating and lighting; (a score of more than 100 is possible though will require net export of electricity to the grid for instance from PV or micro chp).

Other main changes are the inclusion of thermal bridging (sometimes referred to as cold bridging) around doors windows and floor/wall junctions, and the inclusion for the first time of a cost element for lighting.

Social landlords are required to switch to SAP 2005 for reporting purposes from April 2007.

Social housing providers are affected by another change brought in by the EU Directive, which was translated into national law in January 2006. By 2009 an Energy Performance Certificate will have to be made available when a building is constructed, rented or sold. This will be based on SAP, will include recommendations for improvements and be issued by authorised SAP Assessors.

What is NHER?

The NHER has been in existence since 1990 and is intended to provide a guide to total running costs per m^2 rather than just the cost of space and water heating. It includes standing charges and the cost of energy used in space and water heating, cooking, and by lights and appliances. The fuel prices in the NHER are a rolling average of fuel prices for the previous three years, adjusted for inflation.

The computer model used in the NHER calculation is more sophisticated than that used in the SAP, allowing for the effect of location for example (see over).

7. The value of an approach based on SAP targets in Scotland

The case for the approach discussed here has strong practical grounds to recommend it.

- **The information is already collected and held**

The SHQS requires energy data on each property, including the SAP or NHER, to be used to demonstrate progress towards meeting the quality standard as part of the Service Delivery Plan. Low scoring properties can be identified with ease and the effects of improvements analysed.

- **Targets can be set at a local level and monitored**

We suggest that social housing providers set a SAP target for all housing and a higher target for those properties designed for the over 60s. Annual reporting can be on the basis of progress in reducing the numbers of homes that are below the target.

- **SAP, NHER and running costs can be closely related in social housing**

The SAP label is related to the cost of space and water heating, and is not intended as a guide to overall running costs. There does however appear to be a significant correlation between higher SAP ratings and a lower risk of fuel poverty in all sectors of housing.

Table 1 Percentage of fuel poor by SAP band[10]

	SAP value	
	greater than 60	greater than 65
	% Fuel Poor	
Full income definition	**6.8**	**2.8**
Basic income definition	**12.5**	**6.4**

The NHER and several other commercial software programs can be used to calculate total running costs using the BREDEM 12 [11] calculation method. Running costs in BREDEM 12 are related to the energy efficiency rating, floor area, number of occupants, heating patterns and location factors[12]. It is possible to verify that there is good correlation between SAP and overall running costs provided the key variables of property size, occupancy, and location are fixed, as they are in the design of our proposed model.

[10] Defra/DTI (2006), *UK Fuel Poverty Strategy 4th Annual Progress Report* available from www.dti.gov.uk

[11] Anderson, B. et al (2002), *BREDEM-12 Model Description 2001 update*, Building Research Establishment

[12] It is likely that the changes introduced to the new SAP 2005 version will also be incorporated into the BREDEM 12 calculations. If so, predicted running costs will increase slightly as a result of the inclusion of thermal bridging.

8. Designing the model

Although the SAP and the BREDEM 12 calculation make use of the same information about heat losses from the home, heating type and efficiency, the running costs also vary with floor area, heating pattern, number of occupants, and location. If these are set to be appropriate for social housing, the SAP and running costs can then be closely linked.

a) Property size

In Scotland social housing properties have a mean floor area of 76m^2 (Scottish House Condition Survey 2003). Here a 80m^2 house type is used for modelling purposes, though floor areas up to 100m^2 do not result in appreciable differences[13].

b) Number of occupants and heating pattern

The effect of occupant numbers on running costs for an 80m^2 house with an NHER of 5 (the current SHQS standard), and a heating pattern of 16 hours a day is shown in table 2.

Table 2 Effect of occupant numbers on running cost

Occupants	1	2	3	4	5
	Running Cost (£s)				
Space heating[14]	651	616	581	548	518
Water heating	53	71	90	108	126
Cooking gas	11	13	15	15	17
Cooking electricity	20	24	27	27	30
Lights and appliances	135	170	205	205	239
Standing charges	102	102	102	102	102
TOTAL	**973**	**996**	**1019**	**1044**	**1073**

Although running costs rise with larger numbers of occupants, the increase is less than £30 a year (about 3%) for each additional occupant. The increase in minimum income related to each additional person for those on benefits is much greater than £30 a year (£2,377 for a child), with the result that fuel poverty as currently defined is concentrated very largely amongst households with 1 or 2 occupants.

[13] Wilkinson, B. (2006), *SAP Targets and Affordability in Social Housing*, Appendix 6

[14] The BREDEM calculation for space heating assumes that much of the heat contributed by other uses such as water heating, cooking, and lights and appliances will offset energy used for space heating. As the non space heating uses increase with larger numbers of occupants, the fuel needed for heating is reduced.

Table 3 NHER needed to avoid fuel poverty in 80m^2 house

Household type	Income[15] £	Maximum fuel cost £	NHER needed
1 Adult <60	2,995	300	>10
2 Adults <60	4,698	470	9.5
1 Adult >60	6,159	616	8.0
2 Adults >60	9,275	928	5.5
1 Adult + 1 child	6,220	622	8.0
1 Adult + 2 children	8,591	859	6.3
2 Adult + 1 child	7,922	792	6.9
2 Adults + 2 children	10,299	1,030	5.2
2 Adults + 3 children	12,675	1,268	4.3

The income of the (non vulnerable) 1 person household is so low that on the basic income definition it would be almost impossible to ensure affordability on energy improvements alone. However, with 2 adults and 3 children in the three bedroom house, the NHER of 4.3 is easily achieved.

As incomes rise with occupant numbers the NHER needed to avoid fuel poverty is more easily achieved. As a result, families are much less likely to be in fuel poverty as their incomes are higher.

The ***minimum*** standard (NHER of 6.3) has been based on the 1 adult 2 children family running costs and income. It is proposed as being readily attainable by most social housing providers in the short to medium term (see d) and therefore represents a reasonable interim standard.

The worst case, long term scenario is where a one person over 60 household occupies the former family home. Here this is used to establish a ***recommended*** rather than a minimum NHER of 8.

The NHER needed for the 1 adult 1 child family in a three bedroom house is similar to that for the one person over 60, since the running cost is only slightly higher and income is almost identical.

Attaining the minimum NHER would not guarantee affordability for one person over 60 households, or those consisting of 1 adult and 1 child, even where they occupy smaller properties. Achieving the recommended rating will allow all vulnerable households to have affordable warmth.

c) Location

The space heating component of running costs varies, as one might expect, for the different regions of England, Scotland, and Wales to account for their different climate conditions.

The NHER takes account of the regional climate data (degree days and solar gain) in calculating running costs. An NHER of 8.0 would ensure affordability anywhere in England, Wales or Scotland for the 1 person household suggested as the recommended target (see above).

[15] Department of Work and Pensions, May 2006

The SQHS gives a SAP of 50 as an alternative to an NHER of 5.0. The SAP does not vary with location, but the running costs and NHER are different for the various regions in Scotland. For social housing providers who choose to use the SAP rather than the NHER, a SAP target will depend on the degree day region.

Adjusting the SAP for location

In table 4 NHER ratings have been used to group the Scottish degree day regions into four location bands with similar climate (based on external temperatures and solar gains) to illustrate the corresponding running costs based on a house with a SAP of 55[16].

Table 4 NHER and running cost for house with a SAP of 55, dependent on location

	SAP 55		
	NHER	**£**	**Band**
South West Scotland	5.6	890	A
West Scotland	5.5	904	
Borders	5.3	932	B
Highlands	5.2	942	
Western Isles	5.3	939	
East Scotland	5.3	932	
North East Scotland	5.0	981	C
Orkney	5.0	980	
Shetland	4.7	1038	D

Although Scotland is often cited as being much colder than England, the majority of Scottish households are located in areas which are no colder than the North East of England. There is a larger variation in running cost (£130) between the North East and South West of England than between the North East of England and Shetland (£73).

As the SAP rating increases (due to better insulation, glazing, and heating), the difference in running cost between Aberdeen (North East Scotland) and Cornwall (SW) narrows. At a SAP of 100 the difference is only £60, but at a SAP of 55 there would be £250 of additional expenditure in Aberdeen compared to Cornwall.

Figures 1 and 2 show SAP ratings for 4 location bands for Scotland and the corresponding running costs for 1 and 3 person occupancy. The suggested SAP ratings for each of the four locations can be read off the graph using the minimum income figures[17] for a one person over 60 household (recommended SAP) and one adult two children (minimum SAP). The resulting SAP targets for each location band are shown in Table 5.

[16] Chosen for illustrative purposes only, as the mid point of the two SAP standards in the SHQS

[17] see Table 3

Figure 1 Running cost for 1 person occupancy by SAP

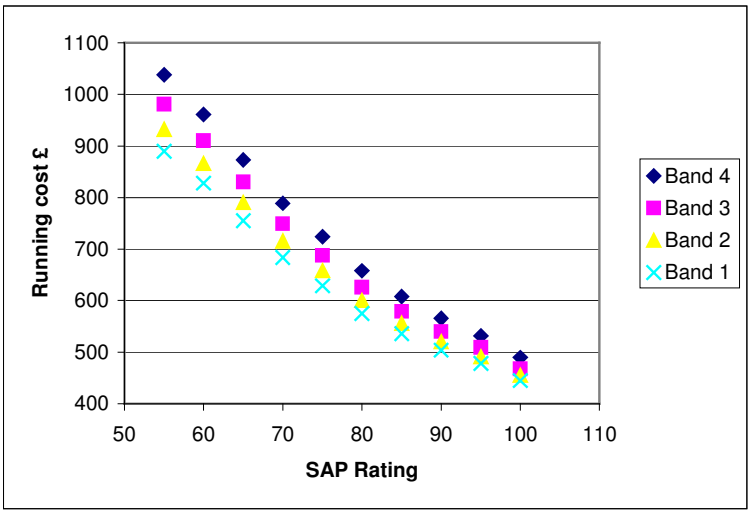


Figure 2 Running cost for 3 person occupancy by SAP

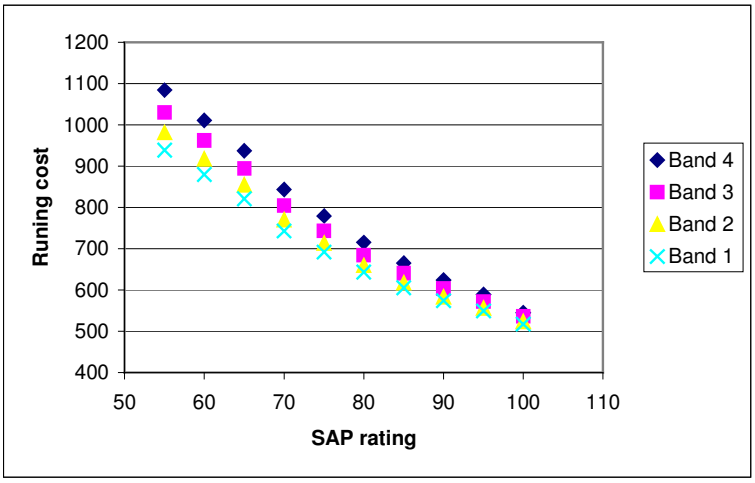


Table 5 Suggested SAP targets for Scotland by location

Location Band	A	B	C	D
Recommended SAP	76	78	80	83
Minimum SAP	61	63	66	69

d) Achieving the target

The NHER for the various combinations of heating, glazing, and insulation for the standard 80m^2 house type is shown in table 6 as an illustration of the effects of various energy improvements and heating types.

Table 6 Effect of improvement measures on NHER ratings

	Solid wall		Insulated wall	
Heating type	Single glazed	Double glazed	Single glazed	Double glazed
'Old' gas	4.5	4.9	7.0	7.9
New gas	6.3	6.8	8.5	9.1
Storage (new)	2.0	2.4	4.2	5.2
Coal	3.1	3.5	5.5	6.5
Oil (new)	4.4	4.9	7.0	7.9
GSH Pump	4.8	5.3	7.2	7.9
ASH Pump	3.7	4.1	6.0	6.9
Wood boiler	3.0	3.4	5.4	6.3

The minimum NHER of 6.3 cannot be achieved for the 'Hard to Treat ' combination of solid wall and off mains gas, without major expenditure and disruption. In contrast, in areas with mains gas, the minimum can be achieved even with solid walls and single glazing. The recommended NHER of 8.0 can not be achieved in this house type off mains gas, even with double glazing and insulated walls.

A very recent publication[18] illustrates some of the difficulties in meeting the SHQS standard of NHER 5 as well as the inadequacy of the standard itself as an indicator of affordable warmth.

9. Accuracy of the data and calculation

Clearly for a strategy like this to be effective it is important to address issues of accuracy and reliability, otherwise properties could be wrongly classified as unaffordable.

The "full" SAP calculation requires that heat loss areas are fully defined and heating completely specified. This is the type of information that would be used to calculate SAP ratings for Building Control approval. The concept of producing a very approximate average energy rating (Level 0) for a housing stock was introduced in the early 1990s to guide the selection of dwellings for improvements on the basis of low ratings. It has generally been assumed that the average of the SAP or NHER results would be much more accurate then individual ratings, which are not intended to be quoted.

[18] Energy Saving Trust (2006), *Guidance on meeting the energy efficiency requirements of the Scottish Housing Quality Standard*, available from www.est.org.uk/uploads/documents/housebuildings/shqs_guidance.pdf. Nb The illustrative running costs in this document are taken from the NHER cost table and do not reflect current fuel prices since they are an average of prices for the three years to 2005. Current prices are likely to be in the region of 40% higher.

Level 0 was originally intended as a short term solution, with data mainly being provided from existing information such as rent databases combined with heating, insulation and glazing contract information. However, until the introduction of the SQHS the cost of organising surveys of individual homes led most social housing providers to 'stick' at this level, since current reporting requires only the average SAP. Worse, many stock condition survey companies have adopted the Level 0 methodology even though accurate data could be collected on site visits at little extra cost.

The Scottish House Condition Survey used the Level 0 methodology in the early 1990s, but additional data items have since been added to improve the overall accuracy and to enable the calculation of running costs for fuel poverty purposes. The current data set is between NHER level 0 enhanced and NHER level 1, apart from the use of SEDBUK and interlock in the calculation of boiler efficiency[19].

Communities Scotland guidance states that NHER and SAP ratings used for the SHQS should be at NHER Level 1 or NHER Surveyor. However, some social landlords have data at a lower level collected as part of stock surveys. This section deals with the differences between the levels of data as a guide to using this data source as a temporary guide to affordability.

The variety of assumptions (defaults) by different software and the range of differing levels of data collected have given rise to wide variations, even in results for average SAP. In response to this problem, the Reduced Data SAP (RDSAP) has been developed to ensure a common data collection and calculation method for SAP ratings on existing (rather than new) properties. This method will become the 'norm' for quoting SAP ratings and the RDSAP value is used here as a benchmark to assess the accuracy of existing SAP and NHER ratings.

The commercially available program NHER Surveyor, with over 4,000 surveyors and assessors trained, is widely used by social housing providers, with over 1,000 people trained in Scotland alone. The program and method are used here as a comparison with RDSAP and Level 0 as the only site survey tool with quality assured ratings, a data level fairly close to that of RDSAP and similar defaults.

The main assumptions in the different levels of data relate to heating and controls, heat loss areas, and ventilation. Here each is considered individually and conclusions drawn about likely degree of error. Then by way of illustration, individual SAP results are compared for two authorities where information at RDSAP level has been recalculated several times, each time with the data reduced to a lower level[20].

The main conclusions are:

b) Level 0 with adjusted defaults plus accurate heating data is likely to give a reasonably accurate picture overall of which homes do not meet the SAP standard for social housing. Typically, the lower level data set underestimates

[19] For a detailed explanation of the levels of data collection please refer to Wilkinson, B. (2006), SAP Targets and Affordability in Social Housing, pp 12 – 13, and p 22

[20] Please see Appendix 1

the "true" NHER or SAP. For a SAP target of 60, around 4% would be classed as failing by more than 5 SAP points (0.5 for NHER) when in fact they would be likely to meet the target if more accurate data were used.

c) Level 0 without adjustments and with basic information about heating not only considerably underestimates SAP by around 5 points on average (0.5 for NHER), but would classify many as failing when the more accurate SAP would not.

d) Monitoring against SAP targets and annual reporting on progress can only be carried out meaningfully if heating data is accurate and defaults for minor items are not used. Measured surveys are not essential for the use of the SAP but should be used for all fuel poverty calculations.

a) Improving accuracy – overall conclusions

In the longer term all social housing will have an Energy Performance Certificate, either when the property is let or obtained as part of some other process such as the SHQS. At present the majority of housing providers have information on the entire housing stock but at a lower level, or have a sample of properties that have been rated at a higher level. The collection of energy data for the SHQS as part of the Standard Delivery Plan will be at NHER Level 1 or NHER Surveyor.

In the short term the accuracy of Level 0 can be substantially improved in the following ways:

- Minor items should be altered from existing knowledge – extract fans, floor types, wall types, chimneys, rather than being defaulted

- Good central heating information is absolutely essential – controls as well as boiler efficiencies for newer boilers

Dimensional information for houses is not essential to give a reasonably accurate assessment. For flats the main source of error is the number of walls exposed. This can often be deduced from floor plans, but may need a site visit.

Accurate gas central heating information can be collected within a year since all properties with gas must be serviced annually. Details of the boiler are normally recorded on a servicing database and can be used to provide the actual SEDBUK efficiency. The detail of the controls and information about water heating takes only a few minutes to collect and can be carried out at little extra cost by the servicing engineer.

10. Fuel price increases and targets

In SAP 2001, the costs of non space and water heating (apart from electricity for pumps and fans) is not included in the SAP calculation. Increasing the price of electricity has only a slight effect on the SAP even in SAP 2005, since only the energy used for lighting, pumps and fans is used in the calculation. The NHER calculation does allow for the cost of the electricity used in lights and appliances.

The recent rapid rise in prices for the domestic sector does not seem to have been foreseen by DTI. The fuel poverty ready reckoner produced by DTI in 2003 only considered price rises by 2010 of up to 20%. In March 2006 Energywatch suggested that average gas bills had increased by 63%, and electricity bills by 44% since 2003. Between July 2005 and October 2006 gas prices rose by 40% for most suppliers.

The price increases for gas are a result of shortages in capacity and also the rapid increase in the world price of oil, to which many gas contracts are linked. The percentage rise in electricity prices has been less than that for gas as electricity is generated mainly from other fuels (about 38% from gas).

DTI (EEPH, conference July 2006) consider that domestic gas and electricity prices are likely to stabilise in the near future, resulting in a continued fall in the numbers of households in fuel poverty to 2010. Gas and electricity prices are likely to fall back to their 2005/6 levels over coming months following a period of increasing prices from all suppliers.

We have considered the effect on SAP and NHER targets of a 10% / 6% (gas / electricity) and 20% / 12% (gas / electricity) increase in fuel prices relative to the incomes of those on benefits, by recalculation of running costs using the increased fuel prices.

For NHER, the effect of a 10% increase in fuel prices over the range of 6.0 to 9.0 on the NHER scale is to require an NHER 0.4 points higher.

For SAP, as an approximate guide analogous to the DTI ready reckoner on fuel poverty numbers, we suggest that the target should be increased by 6% for each 10% rise in gas prices *relative to benefits*. This assumes that electricity prices will follow the gas price rise but only at ⅔ of the rate of increase.

The SAP targets are then as follows: -

Table 8 SAP Targets – effect of fuel price increase

	Location Band			
	A	B	C	D
	June 2006			
Recommended SAP	66	71	74	78
Minimum SAP	51	56	59	64
	Fuel Price Increase 10%			
Recommended SAP	70	75	78	83
Minimum SAP	54	59	63	68

11. Northern Ireland

The characteristics of fuel poverty in Northern Ireland differ from those in the other devolved nations in several ways. Social housing in Northern Ireland is generally better insulated than in England, with only 9% (mainly those with solid walls) of Northern Ireland Housing Executive (HIHE) homes not having wall insulation. Despite this the proportion of those in fuel poverty in social housing is much higher than in England due to the combined effect of higher fuel prices and lower incomes. Expenditure on fuel per household in Northern Ireland has historically been around 20 – 30% higher than the UK average[21].

a) Fuels and fuel prices

The climate in Northern Ireland (in terms of external temperatures and solar gains) is similar to The Midlands region of England. However, the mix of heating fuels and their corresponding prices are quite different.

Table 9 Household heating fuels 2004[22]

	Mains Gas[23]	Oil
	%	%
England/Wales/Scotland	85	7
Northern Ireland	8	65

The market for domestic heating fuels has also been changing very significantly in recent years. Before 1994 householders in Northern Ireland had no access to mains gas and there was a high incidence of solid fuel heating. Between 1994 and 2004 over 54,000 households converted to mains gas, but even more significantly, the number of households with oil heating rose from 215,000 to almost 444,000, with corresponding decreases in those using solid fuel in particular, electricity and LPG[24].

In the NIHE sector, a large proportion (24%) of households still heat their homes with solid fuel, though this had dropped by almost 50% in the three years prior to 2004. 39% of NIHE homes have oil heating.

Changes in the price of heating oil clearly have an enormous impact in Northern Ireland compared to the other devolved nations, although the price to the consumer is slightly lower overall. In addition, both mains gas and on peak electricity are much more expensive than in England. Oil heating is currently cheaper than mains gas in Northern Ireland, though is subject to rapid price fluctuations. The SAP rating as used in England is therefore a poor guide to running costs in Northern Ireland.

Table 10 Fuel Prices in Northern Ireland and the rest of Great Britain p/kWh[25]

	Gas	Oil	Electricity
Phoenix Gas/ NIE/average oil	4.07	3.01	11.02

[21] Northern Ireland Housing Statistics; www.dsdni.gov.uk
[22] 2004 Interim House Condition Survey (2006)
[23] In Northern Ireland mains gas is mainly restricted to the Belfast Urban Area
[24] 2004 Interim House Condition Survey (2006)
[25] As at October 2006

Scottish Power Gas/ Electricity /average oil	2.59	3.01	7.47

b) Social Housing

84% of social housing in Northern Ireland is controlled by the NIHE. Its policy has been to replace solid fuel heating with mains gas where available, and with oil in non gas areas. This has resulted in reductions in carbon emissions and greater convenience and control for tenants, but rapid increases in fuel prices have partly offset what were intended to be significant running cost savings.

The relatively small Housing Association sector has a higher proportion of new dwellings, with a third built since 1996[26].

Unlike in England there are no annual reporting mechanisms for average SAP ratings, with House Condition Surveys only reporting on a sample, normally every two to three years. The Northern Ireland Fuel Poverty Advisory Group has suggested that a suite of indicators be developed "to be used year on year to monitor changes in the nature and causes of fuel poverty to target resources for best effect"[27]. SAP targets, such as those discussed here, can be used in this way to give an indication annually of progress towards affordability.

c) Lower Incomes

According to a recent report[28] Northern Ireland has lower incomes and a higher proportion of people on benefit that anywhere else in Britain. In social housing 80% of heads of households are not in paid employment. 27% of those over the age of 60 receive the guarantee element of Pension Credit, a considerably higher figure than the next worst region (North East England at 22%). The average figure for Britain as a whole is 17%.

Given the combination of high fuel prices and low incomes, improving energy efficiency alone is unlikely to be sufficient to remove people from fuel poverty[29]. In 2001 it was estimated that 17% of households would remain in fuel poverty after all heating and insulation improvements had been carried out[30].

d) SAP and affordability calculations

Running cost calculations for Northern Ireland need to take account of the very different pricing regime for heating fuels there. In SAP 2001 and SAP 2005 the price of gas relative to oil and electricity is based on the pricing structure in the rest of the British Isles. For example, SAP ratings are higher for gas heated houses as the fuel cost is assumed to be around 75% of that for an oil heated house. In Northern Ireland however, gas is much more expensive than in England, but oil prices are similar. As a result, although oil

[26] N. Rice, NIHE, presentation to Northern Ireland Fuel Poverty Advisory Group, 17 October 2005
[27] Northern Ireland Fuel Poverty Advisory Group, First Report March 2006
[28] Policy Studies Institute and Joseph Rowntree Foundation (2006) *Monitoring Poverty and Social Exclusion in Northern Ireland 2006*, JRF
[29] 2001 Northern Ireland House Condition Survey
[30] A point re-emphasized in the 2004 Interim Survey p103

heating is cheaper than gas in Northern Ireland, the SAP ratings for oil heated dwellings are lower.

Table 11 Fuel prices in SAP and in June 2006 p/kWh

	SAP 2001	SAP 2005	N Ireland	England
GAS	1.34	1.63	3.55	2.25
OIL	1.63	2.17	3.50	3.50
ELECTRICITY	6.98	7.12	10.74	7.11

In Tables 12 and 13 the running costs for the standard house type (see a)a)on page 9), calculated for both oil and gas heating, are based on Northern Ireland prices[31] at June 2006. (Running costs for a gas heated house, at English prices, are also shown for comparative purposes).

Table 12 Running costs – one person occupancy

	SAP Rating									
	55	60	65	70	75	80	85	90	95	100
	Running Cost £									
GAS	1294	1162	1074	948	862	775	712	662	614	563
OIL	1154	1054	976	875	798	726	671	637	594	539
England (gas)	907	823	767	687	633	578	538	506	475	443

Table 13 Running costs – three person occupancy

	SAP Rating									
	55	60	65	70	75	80	85	90	95	100
	Running Cost £									
GAS	1346	1254	1160	1035	953	854	798	751	712	663
OIL	1236	1141	1066	965	896	833	781	745	704	658
England (gas)	942	883	824	745	693	630	594	564	540	509

Based on the minimum incomes and running costs already discussed (see Table 3 on page 9) a gas heated house in Northern Ireland would need to have a SAP rating around 18 points higher than an identical house located in a region of England with a similar climate.

The **recommended** SAP for Northern Ireland therefore would be **93** (compared to 76 if located in England) and the **minimum** SAP **80** (62 if located in England), levels that are unlikely to be achieved in existing housing (see below).

The average SAP of NIHE housing was 49 in 2001, and had risen to 62 by 2004, reflecting the improvement in insulation and fuel switching to oil and gas heating from solid fuel. Even so 25.1% of tenants were in fuel poverty on the "full income" definition[32].

Over the same period, average SAP ratings for housing association properties improved from 67 to 77. On the definition used here more than half

[31] NIE and Phoenix Gas
[32] see ref 20 above

of the housing association stock would not be affordable despite the high energy efficiency ratings.

12. Discussion and conclusions for Scotland and Northern Ireland

The related report on England and Wales explained how the effect of energy efficiency improvements on affordability in social housing had been more than offset by the rapid rise in fuel prices since 2004[33]. The same is true for Scotland and Northern Ireland. Achieving affordability in the short term would require substantial reductions in fuel prices, at least for low income tenants, perhaps in the form of social tariffs[34], or for central or local government to pay part of the fuel bill (e.g. a voucher) in order to ensure that no tenant has to spend more than 10% of their income on fuel. Ultimately increasing real incomes over the longer term (i.e. relative to fuel prices) combined with energy efficiency *may* mean that fiscal intervention is not necessary to make fuel bills affordable.

In all the devolved administrations the SAP (or NHER) rating for each property will become available as a result of the EPBD. In Scotland a relatively accurate NHER and SAP is currently calculated through the SHQS, and can be used as a guide to inform letting policies and/or fiscal measures. For instance an NHER of 6.3 is the minimum standard for affordability. Even those homes achieving the current SHQS of 5.0 would need to have around £160 of their fuel bill off set in some way (see above) in order to reduce their spending on fuel to 10% of basic income.

In Northern Ireland the problem is even more acute as fuel prices, and the SAP ratings required to ensure affordability, are that much higher. Assuming a minimum SAP of 80, a household with a SAP of 60 currently would need to receive a £400 contribution towards their fuel bill in order to reduce their spending on fuel to 10% of basic income.

In practical terms, deciding who qualifies for a social tariff is likely to be very complex and adds another set of problems if receipt of means tested benefits is a criterion for eligibility. The rise in fuel costs over the last two years is likely to have resulted in a larger number of households in fuel poverty who are not on a means tested benefit.

Using SAP (or NHER) as the mechanism to determine financial compensation in social housing is more directly aimed at the worst properties, and provides a financial incentive to the landlord (or indirectly to central government) to improve energy efficiency.

[33] Wilkinson, B. (2006), *SAP Targets and Affordability in Social Housing*, pp 14 - 15
[34] see discussion on social tariffs in Wilkinson, B. (2006), *SAP Targets and Affordability in Social Housing*, pp 18 - 19

Appendix 1 Accuracy of data collection and calculation methods

The main assumptions in the different levels of data relate to heating and controls, heat loss areas and ventilation. Each is discussed individually here, with some conclusions about likely error. Finally, two data sets with information at RDSAP level have been recalculated several times, with the data reduced to the different lower levels and the individual SAP results compared for each property.

Heating, boiler efficiencies and controls

The biggest variation in SAP is related to heating efficiencies and controls rather than heat loss areas or exact thickness of insulation. In the absence of information, decisions about assumed efficiencies are crucial. If we are looking for an accurate average SAP for a housing stock then using average efficiencies and controls for a particular boiler type will give an answer that is approximately correct. In practice most default values for heating are biased towards a worst case.

The adoption of the SEDBUK in 1997 together with minimum efficiencies for both new and replacement boilers has resulted in modern boilers being much more efficient. In the SAP calculation if the actual boiler efficiency is not known, one of a set of default values can be used. These are set to be the lowest for the particular type of boiler and are not intended to be correct “on average”.

For the lowest data level, gas boiler efficiencies are defaulted to only three types - old (65%), new (73%), and condensing (83%).

When the efficiency of boilers recorded in the SEDBUK database was analysed to compare default and actual efficiencies, for those boilers categorised as new but non condensing (default value 73%), of the 770 boilers listed only 21 had an efficiency lower than 76%, and the mean was 79.1%. For condensing boilers (default value 83%) 82% of the 549 boilers in this category had an efficiency of 90% or higher, with the overall mean being 90.2%.

Since crucial information on controls is lacking, the default in NHER Level 0 and others is usually a room thermostat and programmer, but no boiler interlock (an efficiency measure which causes the boiler to turn off when there is no demand for heat). In the SAP calculation, not having an interlock results in a reduction of 5% in the boiler’s seasonal efficiency. The interlock assumption (if in error) will typically give a Level 0 answer that is too low by 3-4 SAP points compared to the ‘correct’ value in NHER Surveyor or RDSAP. Modern boilers in social housing fitted as part of a planned upgrade would normally have had the controls improved to give an interlock. Since 2002, Building Regulations have required boiler replacements in all sectors to have the controls required for an interlock.

Conclusion - the SAP is likely to be under estimated by 3 – 4 points if the boiler has an interlock and under estimated by 6 – 7 points if the boiler has an interlock and the default efficiency for modern (post 1998) boilers is used.

Heat loss areas

Table A2 Heat loss areas - dimensional data comparison

	Level 0	NHER Surveyor	RDSAP
Wall, floor, roof, and glazing types	Only 1 of each can be used in the calculation	Two of each if in extensions, + multiple options for glazing and frame	Three wall types for both main house and extensions.
Floor area	From property type, age, rooms, storeys	Measured	Measured
Room heights	Defaulted from age	Measured for each storey	Measured for each storey (and any extension)
Gross wall area (including windows)	Estimated from floor area and property type	Estimated from ground floor perimeter, room heights, property type and individual floor areas	Calculated from perimeters at each level and room heights.
Window areas	Estimated from property type, age, and floor area	Estimated from property type and floor area	Estimated from age and floor area
Zone 1 area *	= 25% of ground floor area	Approx = 2 /(room total +1)	Function of habitable rooms and floor area from Table

** The definition of habitable rooms in RDSAP only includes bedrooms and living rooms (lounge, dining etc). Thus a two storey, 3 bedroom house with a living room, dining room, bathroom, kitchen, and hallway but no dining room has 5 habitable rooms, and 8 rooms in total. This gives different zone 1 fractions, but has only a slight effect (no more than 1) on the SAP, with the Level 0 being too high.*

Conclusions

The main problem with Level 0 estimated heat loss areas is related to flats and mid terraced houses. The heat loss through house walls is very largely a function of the house type: detached - 4 walls, semi - 3 walls etc. Flats have a heat loss through an often unspecified number of walls, and this can result in larger errors if averages are used.

Older (pre 1930) mid terraced houses may have SAP ratings that are perhaps 4 SAP points too high at Level 0, since the wall area prediction is quite critical in the accuracy of the calculation. There are relatively few of these in local authority housing.

Overall comparison of Level 0 and RDSAP

The data from two local authorities with data at RDSAP level were used as the basis for analysis of the accuracy of the SAP calculation. Both authorities are good performers in terms of insulation and heating improvements, and in both cases the average SAP reported is over 70. The results are shown in the table below.

Authority 1 has carried out 3,500 surveys at RDSAP level in the last year using a group of trained and qualified NHER surveyors who have received additional training on RDSAP. The heating information on boilers was also derived from gas servicing records in order to obtain the actual SEDBUK efficiency.

Authority 2 has house type drawings for almost all of its housing stock. The property database records the house type for each individual property address. The drawings were used to calculate the heat loss areas and perimeters for each type and individual address. Heating, glazing and insulation records have been recorded and updated for over 15 years.

Table A3

Level of Data		Average SAP	
		Authority 1	Authority 2
Stage			
1	RDSAP	74.6	74.3
2	No dimensions used	74.5	74.4
3	As 2 with basic heating only	71.5	71.2
4	Level 0 only	69.8	69.1

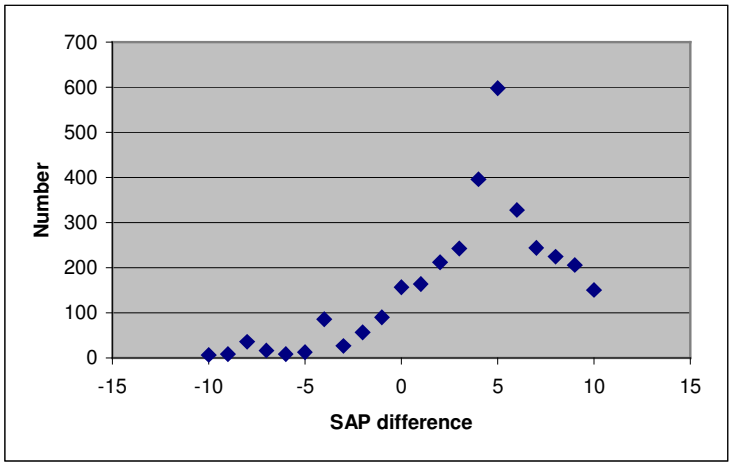
The calculations were carried out initially using data at RDSAP level (Stage1), and then again with dimensional data removed (Stage 2). The geometric model was used to derive all heat loss areas, but all other information was retained.

The SEDBUK information was then removed, so that the boiler efficiency was defaulted from the boiler type, and the RDSAP and NHER assumptions about presence of interlock were also removed and replaced by defaults (Stage 3).

Finally (Stage 4), all heating controls, fans, flues, chimneys, floor types, draughtstripping, water heating controls, cylinder insulation and size were defaulted by the NHER Autoevaluator program instead of being set (Level 0).

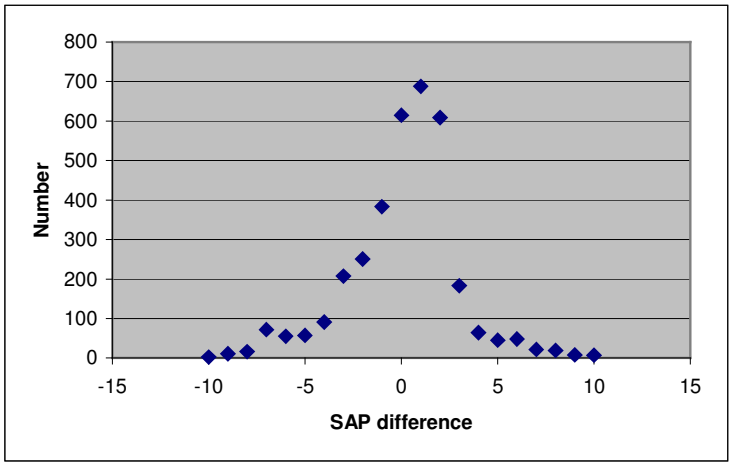
The difference in average SAP between the Level 0 and the accurate RDSAP is around 5 points in each case. The majority of the difference arises from the heating defaults for boiler efficiencies and controls as can be seen by comparing stages 2 and 3. In both authorities the proportion of high efficiency boilers is relatively small but increasing rapidly as older back boilers are replaced by condensing boilers as required by Building Regulations. As the proportion of high efficiency boilers increases, the SAP difference is likely to be greater.

Figure A2 Distribution of differences in SAP (Stages 1 and 4): Authority 1



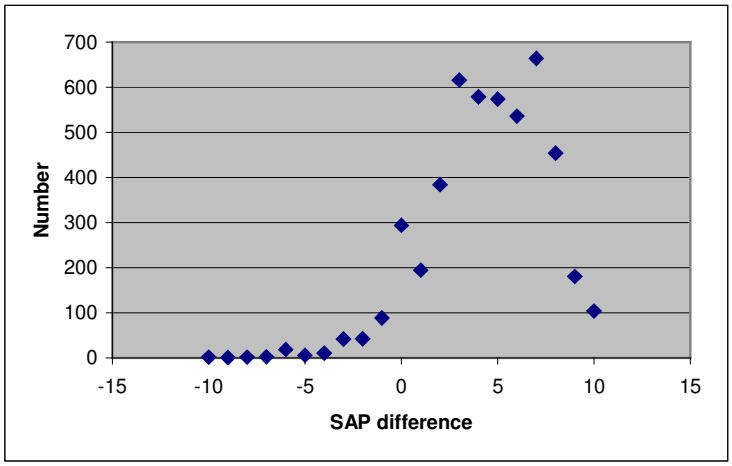
14 results differ by more than –10, and 38 by more than +10 (not shown on graph due to long tail). This includes those that are obvious survey or data entry errors – perimeters of over 100m etc. The obvious bias is clear from the distribution with the differences clustered around the +5 mark.

Figure A3 Distribution of differences in SAP (Stages 1 and 2): Authority 1



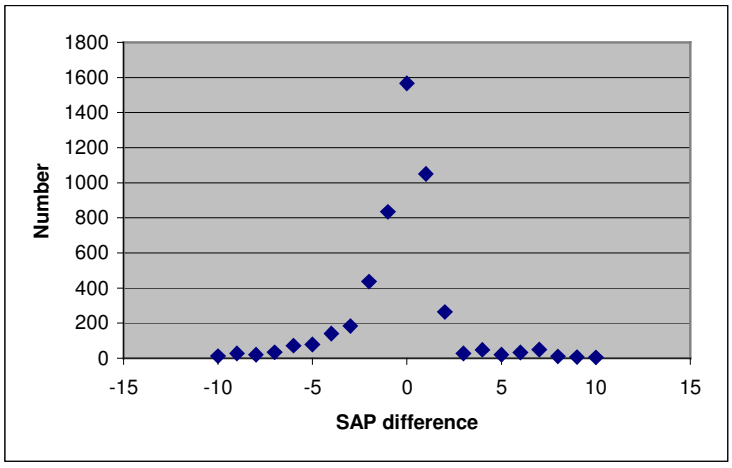
This distribution shows a very slight bias overall (non dimensional SAP is slightly too low) but is much more evenly distributed about the zero position. As a result, the mean is very close to the RDSAP value.

Figure A4 Distribution of differences in SAP (Stages 1 and 4): Authority 2



For Level 0, the systematic bias towards lower ratings is evident with the differences clustered around the 5 SAP point.

Figure A5 Distribution of differences in SAP (Stages 1 and 2): Authority 2



This shows a similar result to Authority 1, with most of the results clustered around the zero, and the mean being very close to the RDSAP value.

Accuracy of identifying homes with lower SAP ratings

The issue for target setting is how well the Level 0 or other method correctly identifies properties that fail to meet the target figure of say 60 or 74. Tables A4 and A5 show the percentage of properties ***incorrectly*** identified as being ***lower than*** the target for Level 0, and also for the 'no dimensional data' method where a visit may not be needed.

Table A4 Authority 1:
% properties incorrectly identified as not achieving target

Authority 1 (site visits)	SAP 60	SAP 60 +/- 5	SAP 73	SAP 73 +/- 5
No dimensional data	18.5%	4%	14%	2.2%
Level 0	44%	15%	37%	15.0%

Table A5 Authority 2:
% properties incorrectly identified as not achieving target

Authority 2 (from drawings)	SAP 60	SAP 60 +/- 5	SAP 73	SAP 73 +/- 5
No dimensional data	13%	3%	14%	2.2%
Level 0	49%	15%	37%	15.0%

The results are very similar for the two authorities, and indicate that the option of deriving a SAP without a site visit has a reasonable level of accuracy, especially if a margin of error of 5 SAP is allowed. The quality standard for RDSAP is likely to be that 95% of SAP ratings should be within 5 SAP points. In this housing stock this could be achieved without visiting to collect dimensions, providing the heating, insulation and other crucial data are correct.