



Evaluation of the Central Energy Efficiency Fund

Report to the Scottish Executive

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Executive summary

Scottish local authorities currently spend over £100 million every year on energy. Most local authorities could use less energy, cutting carbon emissions and making significant cost savings by improving the efficiency of their building services and plant. As well as benefiting the environment, these savings would free up budget from frontline services and contribute to efficient government.

In 2004, the Scottish Executive launched a new public sector initiative: the Central Energy Efficiency Fund (CEEF). £20 million was provided over two years to implement energy efficiency measures which will reduce the carbon emissions across the public sector in Scotland. Within CEEF, £15 million is allocated to the 32 local authorities in Scotland. CEEF supports a rolling loan fund, administered at local level, which funds individual capital projects which meet scheme criteria of energy saving potential and payback.

The Scottish Executive has decided to carry out an interim evaluation of the overall effectiveness of CEEF support to local authorities to date. The evaluation has a number of specific objectives. These relate to both the impacts of the programme to date, and also the effectiveness of the programme in delivering these impacts.

Methodology

The evaluation methodology has comprised two related activities: a desk based analysis of the savings achieved to date; and a consultation with stakeholders involved in the CEEF programme. The evidence from these activities is presented in this report.

Projects implemented to date

As of 19th September 2006, 537 projects had been submitted through the on-line application process. The majority of projects have been implemented in schools, offices and swimming pools: key local authority energy using buildings.

There is considerable variation in the number of projects implemented across Scotland's local authorities: most have made considerable progress, but a few have yet to commit much of their allocated funding.

There is also a wide variation amongst the technologies deployed. Building controls were

the most commonly used measure – although they are not the most cost effective measure, due to relatively short lifetimes.

Across all projects the average payback on the up-front capital expenditure was 3.25 years and the overall lifetime cost of carbon saved was £66/tonne for the fund.

Savings

Projects implemented to date have saved an estimated £1.3 million or 3,609 tonnes of carbon. Taking into account lifetime impacts, the projects implemented to date could potentially save £22.9 million or 80,451 tonnes of carbon.

If project implementation continues at the current rate, by 2010 lifetime savings of almost £104 million, or 392,820 tonnes of carbon will have been realised. Changes in fuel price will clearly influence the cost savings.

The actual performance of CEEF falls significantly short of the Scottish Executive's original aspirations. However, examining these in more detail suggests they are impossible given the current level of CEEF funding.

The study has also looked at how effectively the fund is being put to use. By the end of 2008 about £16 million will have been invested. However, because of the rolling nature of the fund a further £6 million will still be available. Therefore taking measures to increase take up would increase the effectiveness of the scheme.

Effectiveness of the scheme to date

Discussions were held with local authority staff to learn their experiences of CEEF to date. Perceived barriers to take up were examined including the terms and conditions of the scheme and local authority procurement procedures.

Identifying projects

A wide variety of ways of identifying projects were reported, drawing on either monitoring and targeting systems or focusing on payback.

Authorising projects

In many local authorities, considerable effort is needed to secure agreement before a project can be taken forward. In some cases the chief

executives are clearly strongly behind CEEF and this eases approval of projects.

- **Procurement**

Considerable differences were reported for procurement practices in different local authorities and, in particular, in the value of project at which competitive tendering is required. All those spoken to stated that they followed procurement guidance.

- **CEEF terms and conditions**

Two issues were raised as requiring modification; quarterly repayments and five year minimum payback.

- **Guidance from the Scottish Executive**

Now that the scheme is up and running, start up issues are largely resolved and those interviewed said the guidance given to them from the Scottish Executive has been good.

- **Support from the Carbon Trust**

A mixture of views were expressed on multi site assessments. Some raised concerns that the resulting report was too generic and insufficiently detailed, although one local authority felt the assessment was very useful.

Putting the scheme in context

Of other initiatives which currently address energy efficiency in local authorities two are particularly relevant – the Central Energy Efficiency Fund operating in Northern Ireland and Salix's "Invest to Save" revolving fund.

These schemes potentially offer good practice experiences that can be used to improve the Scottish Executive's CEEF scheme.

A comparison has been made on a project basis of the cost effectiveness of CEEF Scotland with CEEF NI and Salix. This indicates average paybacks of 2.9 (CEEF NI), 3.2 (CEEF Scotland) and 3.5 (Salix) and cost/tC/annum of £641 (CEEF NI), £1,205 (CEEF) and £1,354 (Salix).

Northern Ireland might be expected to have a shorter payback as they cannot fund all potential projects and so select the most cost effective. The higher cost effectiveness of carbon abatement in NI arises due to their greater use of high carbon fuels.

Finally, it must be noted that a comparison of the overall programme cost effectiveness has not been made: CEEF is intrinsically low cost as it is a loan scheme, with an automatic project approval system and low overheads.

By contrast the other schemes are both grant rather than loan schemes and both require project approval management procedures.

Issues and opportunities

The issues arising from this evaluation were considered and some options identified to develop the fund in the future:

- **Developing a more strategic direction for project selection**, perhaps by supporting the construction of a Scottish benchmarking system, and drawing on any lessons from the Carbon Trust's LACM programme.
- **Smoothing the way to easier project set up in the local authorities**, by encouraging high level commitment.
- **Changing from quarterly to annual repayments**
- **Considering a revision of the payback criteria**, particularly for local authorities who have made substantial progress.
- **Minor changes to the CEEF web site**, to improve clarity and enable more accurate evaluations of the impact of CEEF in the future.
- **Regular updates to chief executives on local authority performance**, to encourage high level participation and support for CEEF.
- **Requiring additional information on actual energy savings achieved**, to feed into future evaluations.
- **Reviewing the use of Carbon Trust multi site assessments**, in conjunction with the local authorities to ensure they meet the needs of the local authorities.

Looking forward, CEEF has built up a considerable momentum. The use of a loan fund presents a very effective model. At the current rate of progress by 2010 the fund will have invested about £25 million in energy saving technologies. Nevertheless due to its rolling nature, a further £6 million will still be available to fund energy saving projects, which would give rise to further substantial savings.

Optimising the scheme to ensure these funds are put to use could help realise these savings and ensure CEEF produces the most effective and cost effective results.

Table of contents

1	Introduction	1
1.1	Evaluation objectives and approach	1
1.2	Methodology	1
2	CEEF	2
2.1	How the fund works	2
3	Projects	3
3.1	Evaluation of projects implemented to date	3
3.2	Project interviews	9
4	Savings	11
4.1	Potential savings in 2010	11
4.2	Effect of fund size	12
5	Effectiveness of the scheme to date	13
6	Assessment methodology: limitations	16
6.1	Summary of the approach adopted	16
6.2	Data limitations	16
7	Putting the scheme in context	20
7.1	Central Energy Efficiency Fund Northern Ireland	20
7.2	Salix Invest to Save	21
7.3	Comparison of CEEF projects with CEEF NI and Salix	22
8	Issues and options	24
8.1	Identifying projects	24
8.2	Setting up projects	24
8.3	Future evaluations	25
8.4	Terms and conditions	25
8.5	Support from Scottish Executive	26
8.6	Support from Carbon Trust	26
9	Conclusions	27
	Appendices	29
Appendix 1	Details of who was consulted	
Appendix 2	Details of projects analysed in depth	
Appendix 3	Methodology for calculation of savings	
Appendix 4	CHP savings anomaly	
Appendix 5	CEEF Northern Ireland: eligible projects	

1 Introduction

Scottish local authorities currently spend over £100 million every year on energy. Most local authorities could use less energy, cutting carbon emissions and making significant cost savings by improving the efficiency of their building services and plant. As well as benefiting the environment, these savings would free up budget from frontline services and contribute to efficient government.

In 2004, the Scottish Executive launched a new public sector initiative: the Central Energy Efficiency Fund (CEEF). £20 million was provided under CEEF over two years to implement energy efficiency measures which will reduce the carbon emissions across the public sector in Scotland. Within CEEF, £15 million is allocated to the 32 local authorities in Scotland, £4 million to the NHS trusts and £1 million to Scottish Water. The scheme has since been extended to provide £4 million to higher education. CEEF supports a rolling loan fund, administered at local level, which funds individual capital projects which meet scheme criteria of energy saving potential and payback.

The Scottish Executive has decided to carry out an interim evaluation of the overall effectiveness of CEEF support to local authorities to date, and establish whether the £15 million represents good value for money, both in terms of financial and carbon savings. AEA Energy & Environment have been appointed to carry out this evaluation and this report presents the results.

1.1 Evaluation objectives and approach

The evaluation has a number of specific objectives. These relate to both the impacts of the programme to date, and also the effectiveness of the programme in delivering these impacts. The specific objectives of the evaluation are as follows:

- i. To carry out a cost-benefit analysis of the measures introduced through the fund, in terms of the financial and carbon savings achieved, and the sustainability of these savings over time.
- ii. To evaluate the outcomes to date from the four largest capital projects funded under CEEF.
- iii. To evaluate the outcomes to date from a sample of smaller capital projects.
- iv. To benchmark the scheme against other policies to reduce carbon emissions.
- iv. To assess the relevance of the terms and conditions of the scheme, including procurement procedures, and advise if these conditions are being fully adhered to.
- v. To look at barriers to the implementation of projects.
- vi. To assess the advice given to local authorities via multi site assessments and energy audits.
- vii. To assess how the fund has been established and apportioned, and to seek to identify better alternative ways of structuring the fund.
- viii. To assess how far the aims of the fund have been achieved to date.
- ix. To make recommendations, based on above findings, as to the suitability of future projects.

1.2 Methodology

The evaluation methodology has comprised two related activities: a desk based analysis of the savings achieved to date; and a consultation with stakeholders involved in the CEEF programme. The evidence collected and analysed from these activities is presented in this report.

The methodology used in this interim evaluation is detailed in Appendix 3. Where appropriate, the evaluation of savings has followed the guidance laid out in Defra's booklet: Greenhouse Gas Policy Evaluation and Appraisal in Government Departments, April 2006, which is in turn based on the Treasury Green Book.

2 CEEF

2.1 How the fund works

The Central Energy Efficiency Fund (CEEF) is a revolving loan fund under which £20 million was provided over two years to implement energy efficiency measures, which will reduce carbon emissions across the public sector in Scotland. Within CEEF, £15 million is allocated to the 32 local authorities in Scotland, £4 million to the NHS trusts and £1 million to Scottish Water. The scheme has since been extended to provide £4 million to Higher Education.

Each local authority has been allocated a proportion of this £15 million based upon a combination of the population in their city/region and their geographical area. The individual local authorities are responsible for managing their own CEEF allocation and identifying potential capital projects. Funding can only be spent on capital projects, but up to 10% of the fund can be used each year to cover running costs.

To be eligible for CEEF funding, projects must use specific energy saving technologies and must meet a five-year payback criteria. Renewable Energy technologies can also be considered so long as the criteria are met. Technologies eligible for CEEF funding are:

- Building Controls
- Cavity Wall Insulation
- Change of Fuel
- CHP
- Cooling Controls
- Draught Proofing
- Improving Boiler Plant
- Low Energy Lighting
- Motors and Drives
- Other
- Pipe Insulation
- Point of Use Hot Water
- Pool Covers
- Roof Insulation

Once a potential project has been identified, the local authority must complete an on-line application form that requires information on the capital cost of the project, energy use before project implementation, an estimate of energy use after implementation and the price paid for the energy. The form will then automatically calculate the potential annual energy, financial and Carbon Dioxide savings alongside the project's payback period. This is based upon default parameters for the eligible technologies. If the payback does not meet the criteria, the project will be deemed ineligible. However, if the project meets the criteria, the local authority submits the project application that then commits them to spend the money and implement the project. It is expected that once a project has been submitted, the project will be implemented shortly thereafter. Submitted applications are stored in a central on-line system and can be accessed by all other local authorities.

Once spent, the local authorities are required to repay the cost of each project at quarterly intervals within the payback period calculated during the application process.

3 Projects

The CEEF funding is used to implement individual energy saving projects. This section assesses how CEEF has progressed to date by:

- Developing a picture of project implementation across the local authorities, looking at the variety of technologies implemented and the buildings they have been implemented in.
- Supplementing this with detailed discussions relating to individual projects to identify issues influencing project implementation and monitoring under CEEF.

3.1 Evaluation of projects implemented to date

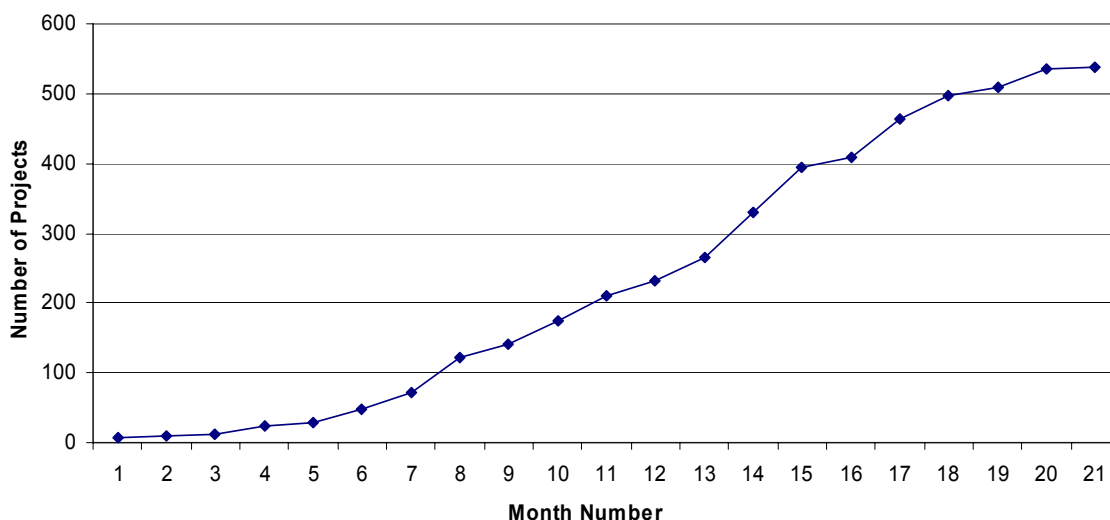
As CEEF has been in operation for a relatively short period of time, most projects have not been implemented for long enough to enable their energy savings to be assessed accurately. This part of the evaluation was therefore based on information supplied as part of the application process, and therefore reflect projected savings. A snapshot of CEEF was taken on 19th September 2006, by which date, 537 projects had been submitted through the on-line application process. This section considers:

- The number and type of projects implemented to date
- The rate of implementation of projects over time
- The variation in project implementation across local authorities

3.1.1 Growth in projects with time

Initially the take up of the scheme was slow. However, the number of projects has greatly accelerated since the first few months of the scheme as local authorities became more familiar with the scheme and have had the lead time necessary to bring projects to fruition. This can be seen in Figure 1 which illustrates the rate at which the number of CEEF funded projects has grown since the first submitted project in January 2005.

Figure 1 Cumulative Project Implementation



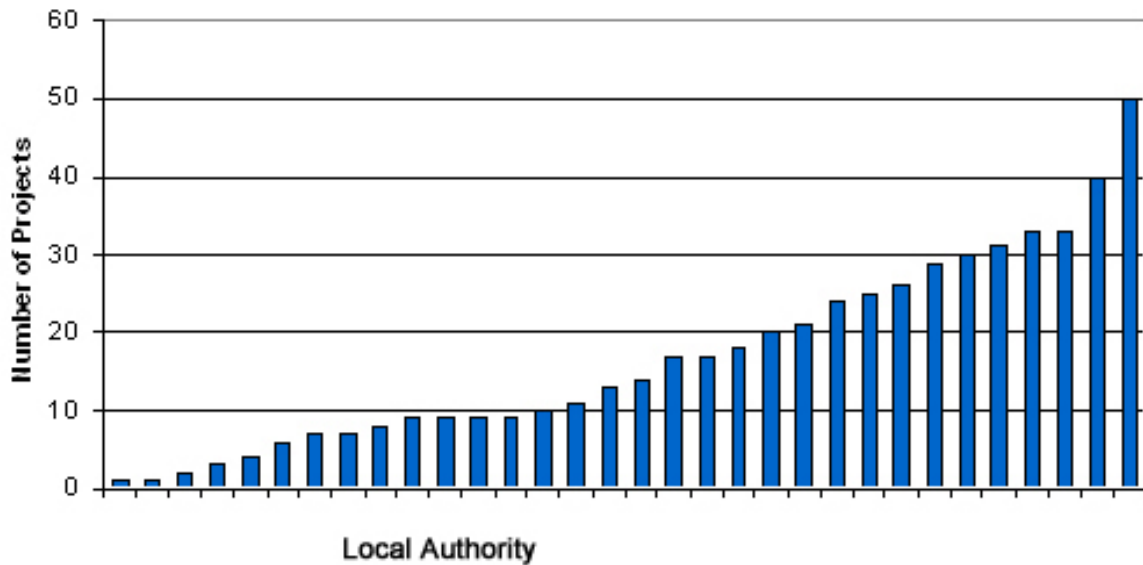
Based upon this rate of project implementation, analysis suggested that by the end of December 2006 there would be a total of 644 completed project applications. The CEEF website was examined on the

20th December and it showed that 641 completed application forms had been submitted. This supports the assumption used in section 4 regarding the future rate of project implementation.

3.1.2 Variation by local authority

There is considerable variation in the number of projects implemented across Scotland's local authorities. Figure 2 illustrates the level of project implementation by each of the 32 local authorities.

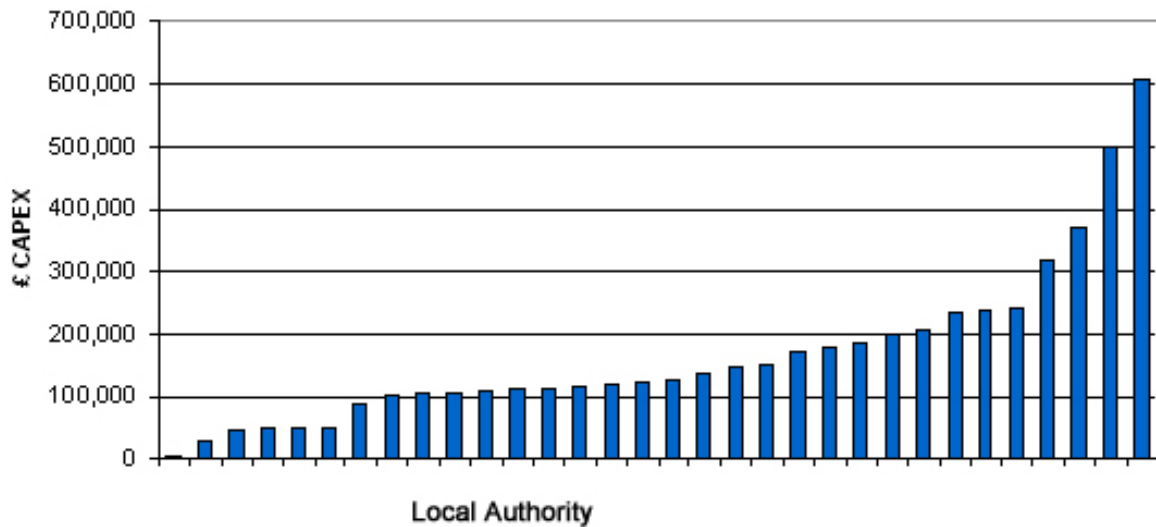
Figure 2 - Project Implementation by Local Authority



As the capital cost of projects varies widely, the number of submitted projects alone does not provide a sufficient measure of local authority activity. For example, one local authority has only submitted one project but it had the greatest capital cost of all the projects submitted to date. This has been taken into account in Figure 3. This figure illustrates the total amount of CEEF money that has been spent on projects by each local authority.

It must be noted that although not included in this analysis, in addition to the £5.3 million CEEF funding spent on projects submitted to date an additional £2.2 million of other funding has been reported as being spent on CEEF projects. In a number of cases, local authorities have used their own funding to augment CEEF funds. Information is not available to clarify the background relating to this additional expenditure and it was therefore difficult to ascertain whether this money was used to offset the cost of equipment or to cover the expense of activities not eligible for CEEF funding.

Figure 3 - Capital Expenditure



The total amount CEEF funding available to spend varies between local authorities. This means that whilst one local authority may have spent less than another they may have spent a larger proportion of their allocation. Figure 4 shows the performance of each local authority in terms of the percentage of their allocation committed to projects.

Figure 4 - % Allocation Spent

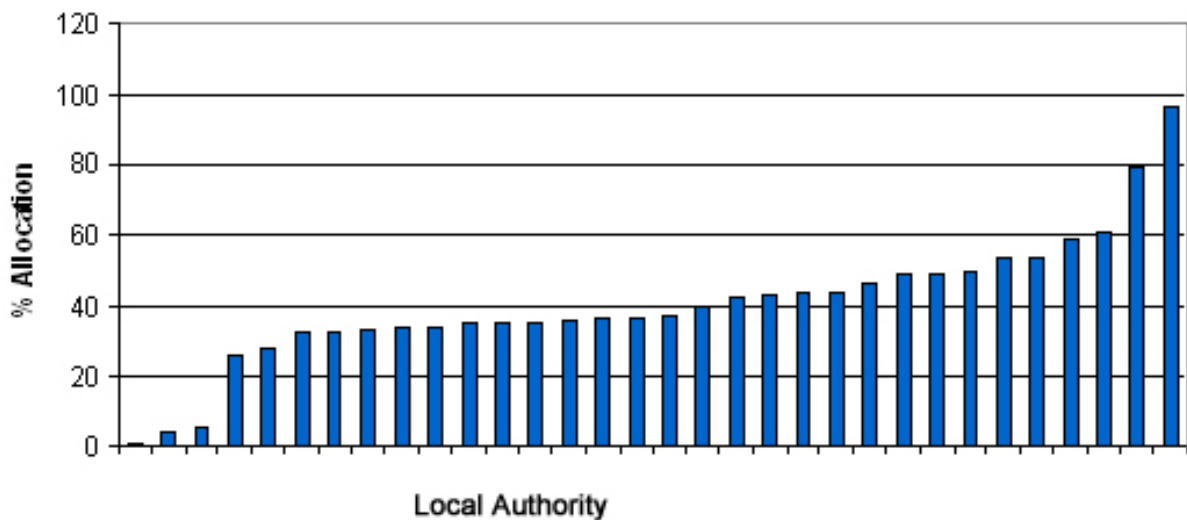
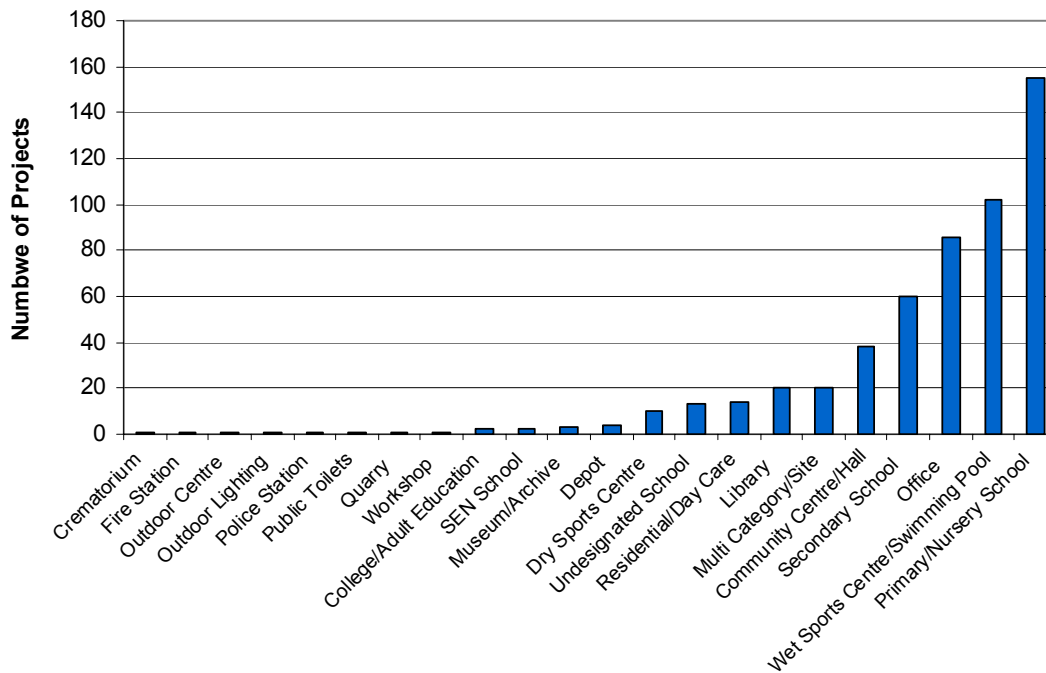


Figure 5 shows the variation in building type where projects have been carried out. The majority of projects have been implemented in only a few building types, in particular in schools, offices and swimming pools. Within the portfolio of buildings under a particular local authority’s control, the most numerous building types are likely to be schools and offices and it is therefore understandable that they are common targets for energy saving measures. As some local authorities target CEEF funding at buildings with high energy demand, it is also understandable therefore that swimming pools are another common recipient of projects.

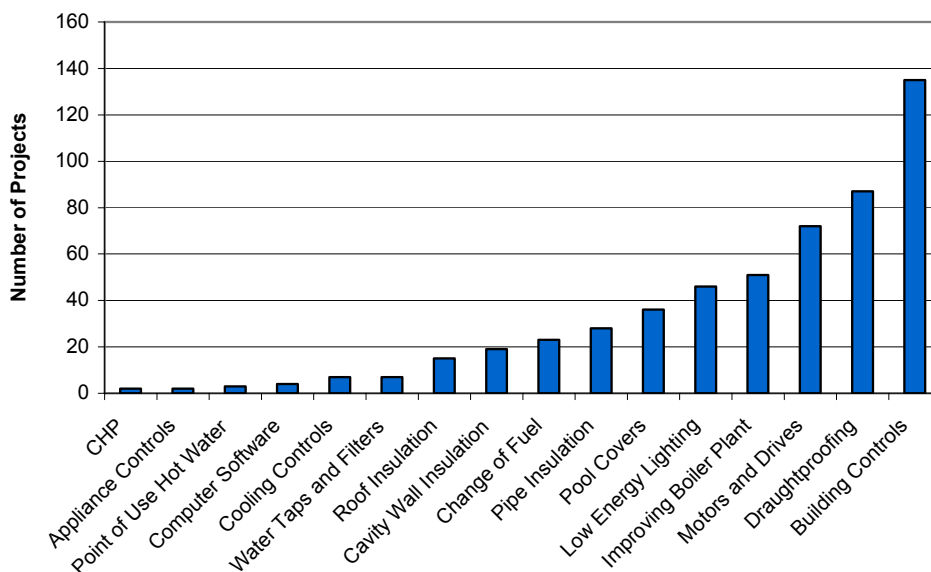
Figure 5 - Number of Projects by Building Type



3.1.3 Variation by technology type

As discussed in section 2, the CEEF application software presents applicants with a set range of technology options. However, it was found that within the “Other” category, a number of the projects would have been better classified under one of the other categories. As a result of re-categorising the “Other” category it was possible to represent a more accurate picture of technology uptake, as is shown in Figure 6.

Figure 6 – Technology Update



Whilst building controls were the most commonly used measure, it is not the most cost effective use of CEEF funding. This is discussed further in Section 3.1.5.

3.1.4 Lifetime Savings

The lifetime savings have been estimated for each project based on the predicted annual savings calculated for each project during the application process and the assumed technology lifetime, this lifetime value is assumed in the application process and is standard for each different technology category. This was done using the methodology presented in Appendix 3. The average lifetime savings across all submitted projects are shown in Table 1.

Table 1 - Average Savings Across all Projects

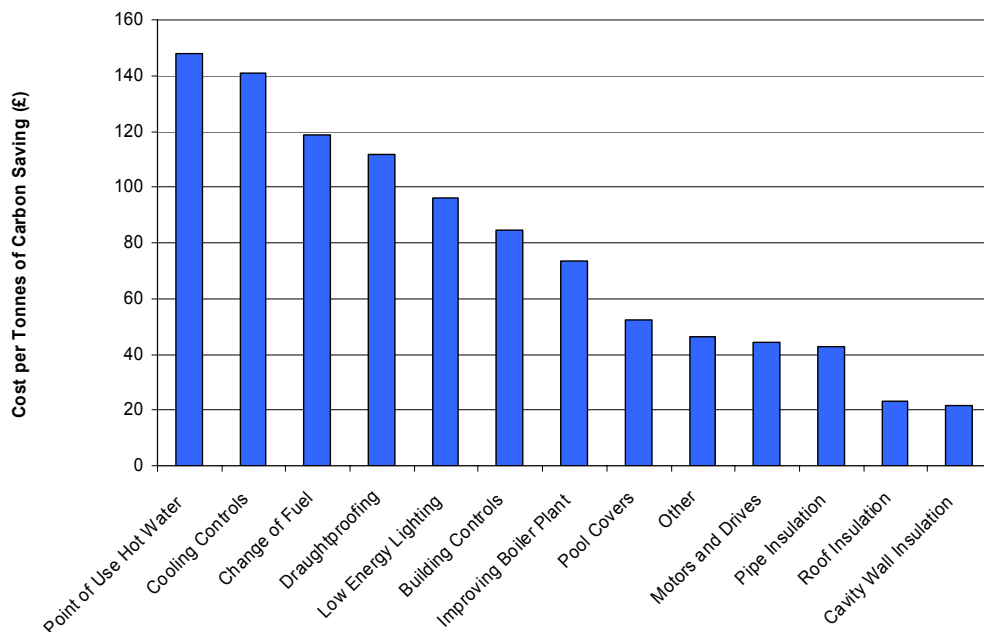
	Average Lifetime Savings of Submitted Projects
Carbon Savings (tonnes)	150
Energy Savings (GWh)	2
Financial Savings (£ at NPV)	£43,000

3.1.5 Cost Effectiveness

Several measures of cost effectiveness of each of the technology types have been calculated, based on the calculated lifetime savings and the capital cost of each project. The methodology used is presented in Appendix 3. The following are presented below:

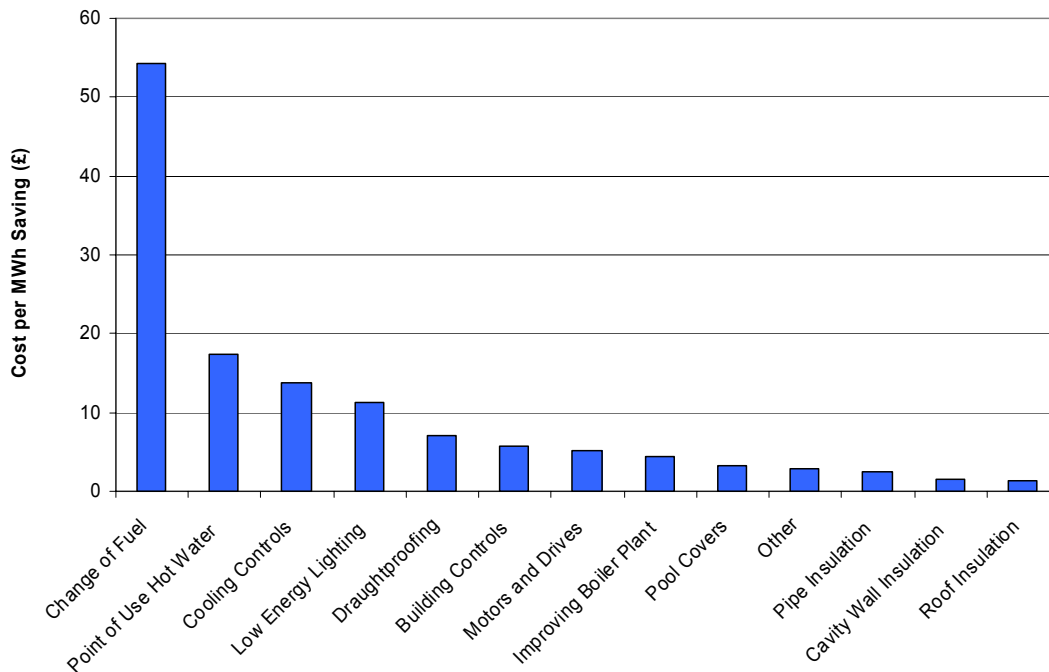
- Lifetime cost per tonne of Carbon Saving
- Lifetime cost per MWh Saving
- Lifetime cost per £K Saving

Figure 7 Lifetime cost per tonne of Carbon Saving



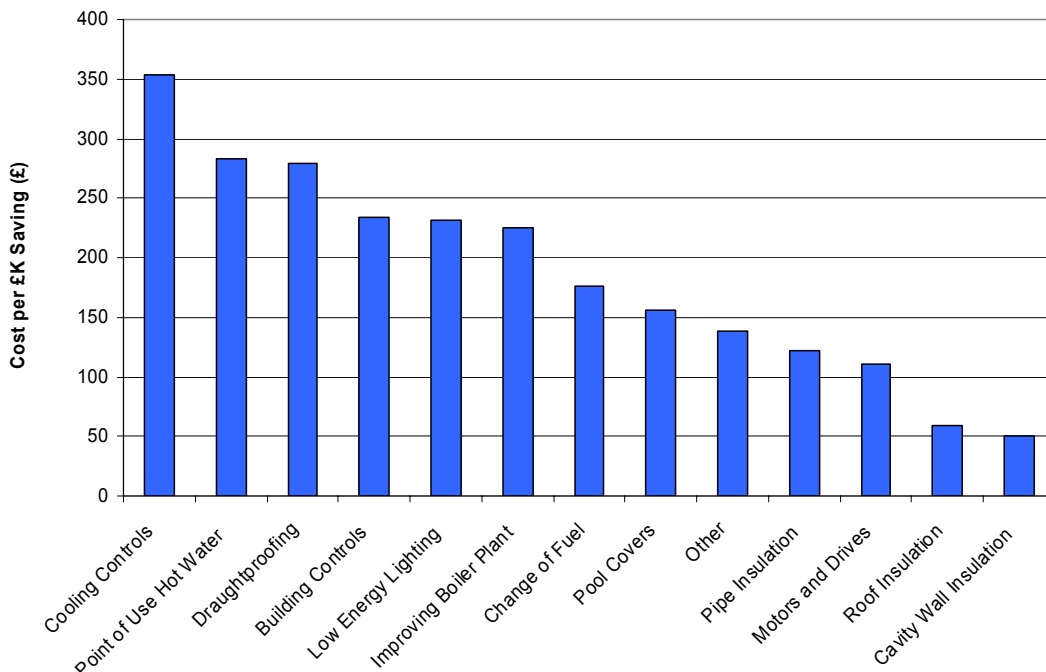
This data indicates that on a whole lifetime basis, insulation represents the most cost effective means of reducing carbon emissions, followed by improved motors and drives and pool covers. These technologies are particularly effective because the savings persist over many years.

Figure 8 Lifetime cost per MWh Saving



Again, insulation is the most cost effective way of improving energy savings. By contrast, although fuel switching can be effective in reducing carbon emissions, it does not necessarily reduce (delivered) energy consumption.

Figure 9 Lifetime cost per £K Saving



Note, in addition to the technologies discussed above, two Combined Heat and Power (CHP) projects have been submitted to CEEF. CHP has been omitted from the figures presented above because there is insufficient information available from the application process to give a full and accurate picture of the benefits of CHP. This issue is discussed in Appendix 4.

It must be borne in mind that whilst building controls were the most commonly used measure, they are not the most cost effective over their lifetime. Roof and cavity wall insulation appear to be the most cost effective measures in terms of energy, carbon and financial savings which is likely to be as a result of their long assumed lifetime of 60 years.

Overall the lifetime cost of carbon saved was £66/tonne. As in section 3.1.2, it should be noted that when assessing cost effectiveness the additional £2.2 million of other funding has not been included in this analysis.

When considering cost effectiveness it is also important to note that CEEF is a loan fund and is therefore highly cost effective because any expenditure on projects, including local authority running costs, will be repaid into the fund. The only true cost of the programme lies in the relatively small costs incurred in the set-up and management of the fund.

3.2 Project Interviews

The objectives of these interviews were to examine the approach taken to project identification, specification and procurement. For example, had good practice guidance been followed and specific targets for energy savings set? One main area of interest was in the way energy consumption figures have been estimated both for before and after project implementation to ascertain the reliability of these figures. It was also hoped that these interviews would help identify barriers faced in the implementation of projects and ways in which the fund could be improved.

These technical reviews focussed on the largest capital expenditure projects and were conducted via telephone interviews with the relevant members of staff regarding the following projects:

- Dundee City Council Improving Boiler Plant at St John's High School
- North Lanarkshire Council Low Energy Lighting at St Maurice's High School
- Glasgow City Council CHP at the Museum Repository
- Glasgow City Council Roof Insulation at the Museum Repository
- South Lanarkshire Council Building Controls at Council Headquarters
- South Lanarkshire Council CHP at Leisure Centre

Project Background

Of the projects studied, there was an equal split between projects identified specifically to reduce energy use, and those taken forward as part of wider ongoing refurbishments. In the latter case, reducing energy consumption was not the sole reason for projects being considered: most of those consulted stated that achieving better internal conditions was an important driver too. For those projects specifically conceived to reduce energy, each project had to be able to meet the five-year payback period, or else it was not developed further.

Performance Standards

With regards to equipment specification, those interviewed commented that they were not merely replacing equipment on a 'like for like' basis. Independent sources of information such as the Government's Enhanced Capital Allowance Energy Technology List and publications from recognised bodies such as BRE and the Carbon Trust were consulted to ensure a good level of energy efficiency was incorporated into any design. Those consulted were aware of Best Practice Standards however no specific targets for energy consumption (e.g. benchmarked on a floor area basis) were stipulated.

All those interviewed said that the projects would either not have proceeded to achieve the same level of energy performance without CEEF funding, or would not have proceeded at all (the case for one of the four projects). The reduced level of energy performance reverted to would be the minimum required to satisfy legislation such as Building Regulations.

Feasibility Studies undertaken in preparation

Only one project undertook a feasibility study. It was mentioned by all that this was due to the local authorities having to fund these themselves. In local authorities it is common to proceed with minor refurbishment works without a formal study, and all those consulted intimated that the design development included an element of feasibility work prior to proceeding.

Estimates of energy consumption – before and after project implementation

Where available, metered energy consumptions were used to obtain estimates of energy consumption before the project was implemented. However, for nearly all projects dedicated sub-metering was not available and a 'best estimate' was used from the energy information held. For initial estimates of energy consumption after implementation, most of those consulted derived data which was modelled using assumptions based on their 'before' values. One local authority mentioned their 'after' energy consumption was estimated via computer based modelling software. The rest relied on the expertise of their consultants or contractors but did not explicitly reveal how these values were arrived at. Only one of the four projects used a dedicated sub-metered value as the input figure.

One project is still at design phase and another three have recently been commissioned. Although the estimates of energy savings declared in the CEEF applications are considered by the applicants all to be reasonably accurate, no quantitative assessment to test the accuracy of declared values has been possible at this stage.

Project Review

Some monitoring has been undertaken on the installed projects in order to review the accuracy of the data submitted and the systems performance. However, as one of the four project technologies is seasonally dependant (a heating system), it is too early to comment on its performance. Those responsible for the other two completed projects commented that they are on target to achieve the 'after' energy value declared in their application as a minimum, with expectations to surpass this.

4 Savings

This section assesses the financial, energy and carbon savings arising from CEEF projects. The methodology used is summarised on page 1 and given in greater detail in Appendix 3. The initial focus is on the savings achieved to date, and compares the likely results with Scottish Executive targets.

Table 2 shows the calculated savings arising from the projects currently submitted to CEEF.

Table 2 - Summary of Savings from Current Projects

	Financial	Energy (GWh)	Carbon (tonnes)
Savings to date	£1,341,100	48	3,609
Savings to end 2010	£8,711,700	302	22,585
Savings to end 2015	£15,370,900	598	44,735
Savings to end 2020	£20,393,900	894	66,885
Lifetime savings	£22,929,900	1,091	80,451

Note: All savings arising in the future have been discounted at 3.5% per annum in accordance with government appraisal guidance, and presented in 2006 prices.

The Scottish Executive's initial aspirations were that CEEF would stimulate and facilitate:

- A 20% reduction in local authority energy consumption over five years, (expressed as a total of £70 million savings over the first five years and then £30 million per year subsequently)
- A Carbon reduction of 0.5 million tonnes over first five years and then 100k tonnes every year subsequently (Note these carbon reduction targets include contribution from Scottish Water and NHS Trusts who also take part in CEEF).

The actual performance of CEEF falls significantly short of these aspirations. However, examining the targets in more detail suggests they are both extremely ambitious and in some regards inconsistent:

- To achieve energy savings worth £70 million over 5 years, given a 3.5 year payback would require expenditure of approximately £50 million at the start of the period.
- 500,000 tonnes C is equivalent to energy savings worth in the order of £200 million
- Based on the average CEEF technology payback it would be necessary to spend £118 million to achieve this carbon target.
- Focusing on the first five years only captures a fraction of projects' benefits: the average project lifetime is of the order of 15 years – so a project starting in 2008 will only achieve a small proportion of its savings by then.

Lifetime savings of over £20,000,000 and associated carbon savings of over 80,000 tonnes are nevertheless worthwhile. In addition, it is important to note that these savings relate only to projects implemented to date.

4.1 Potential savings in 2010

Based upon the current rate of project implementation, (shown in Figure 1) approximately 464 new projects are implemented each year. Their future impact on savings has been estimated, based on average values of annual savings, payback period, project lifetime and project cost. If this continues this would give rise to savings by the end of 2010 as shown in Table 3:

Table 3 – Potential Savings Including Future Projects

	Financial	Energy (GWh)	Carbon (tonnes)
Savings to end 2010	£20,456,400	791	59,170
Lifetime savings	£103,900,000	5,253	392,820

The above analysis has drawn on current fuel prices (in 2006 prices). The average fuel prices described in CEEF submissions are 6p/kWh for electricity and 2p/kWh for gas. Future prices are uncertain, with some estimates of prices showing potential falls. However information has been made available on local authority assumptions of fuel prices in the future, and for example Angus Council assume electricity will cost over 11p/kWh by 2007/8 and gas 2p/kWh. On this basis savings to end 2010 would increase to £38 million and lifetime savings to £192 million.

4.2 Effect of fund size

In looking at the impact of CEEF it is also worth looking at the how much of the potential benefits of the fund the current level of project expenditure is capitalizing on. For example, although £15 million was initially made available, if this is not in drawn down, then the full benefits of the fund size will not be realized. On the basis of the current level of project implementation, estimates suggest that by the end of 2008 over £16 million will have been spent. However because of the rolling nature of the fund, there will remain over £6 million available for investment. This suggests that the current fund could support a still higher level of investment and hence achieve greater energy savings.

The following section looks at how the fund is operating in practice and considers issues which may be barriers to CEEF progressing as rapidly as it has the potential to.

5 Effectiveness of the scheme to date

Discussions were held with local authority staff to learn their experiences of CEEF and in particular the terms and conditions of the scheme, including procurement procedures. Discussions covered:

- Project identification;
- Authorising projects;
- Procurement;
- Project implementation;
- Terms and conditions
- Barriers to successful operation of the scheme;
- Support from the Scottish Executive;
- Support from the Carbon Trust.

Three sets of discussions took place with a range of local authority staff. The local authorities were selected to represent a broad range of experiences of CEEF, including both the full spectrum of success in implementing projects, and also a variety of local authority areas from rural to city. Full details are given in Appendix 1. To summarise the consultations included:

- A workshop hosted by Ron Hill of North Lanarkshire Council, and attended by representatives of Fife, South Ayrshire, North Ayrshire and Renfrewshire councils;
- Telephone interviews with representatives from Dumfries and Galloway, Edinburgh and Glasgow councils;
- Attendance at a meeting of the Scottish Energy Officers Network in October 2006.

To summarise the conclusions of the discussions:

Identifying Projects

There appeared to be two common ways of identifying projects. Firstly, existing monitoring and targeting systems were used to identify the highest energy users, and projects were then designed around these. Alternatively projects were identified on the basis of payback – such as focussing on projects that would give the best payback. Another system mentioned by one energy manager was to select projects which could be easily replicated across their building stock.

Authorising Projects

There are clearly large differences in procedures for agreeing projects in different local authorities. In some local authorities, independent authorisation is required from the heads of each department before a project can be taken forward. In addition, some local authorities work with a system of devolved budgets which requires permission from each individual institution (for example, each school) as well as the head of department. This means that getting authorisation for projects can be very time consuming, slowing down the rate of progress. Another local authority does not recover funds from a specific low level budget: as this is seen to present an unnecessary barrier to scheme operation. In some cases the chief executives are clearly behind CEEF and this can mean that approval of projects is automatic: it is only necessary to inform the staff concerned rather than seek their approval. This greatly speeds up the process.

Procurement

Considerable differences were reported for procurement practices in different local authorities and in particular, in the value of project at which competitive tendering is required. For example, in one local authority, for projects worth less than £50,000, three quotations from contractors need to be obtained, and projects worth over this amount are put to competitive tender. However, for another, projects worth over £30,000 must be put to competitive tender, and for those worth less than this there is no formal procedure in place. This can clearly influence the speed at which local authorities can progress projects, as placing a project out to competitive tender takes time and effort. All those spoken to

stated that they followed local procurement guidance. Some local authorities said they felt under pressure to spend their allocation of money, and as such would not select larger projects which would require competitive tender. This is perhaps borne out by the fact that as the rate of project implementation has increased, the average project size in terms of capital cost has decreased from about £12K in 2005 to £8K in 2006.

Project implementation

Everyone interviewed, bar one, said they had used external contractors for project implementation. The local authority who did not use contractors stated that they intend, where possible, to use internal technical staff. It was mentioned by another local authority that they use their own energy fund to finance projects initially, and once the project had been agreed on this comes out of their 10%.

CEEF terms and conditions

Those consulted were also asked if there were any aspects of CEEF terms and conditions that caused problems or could be improved upon for the future. The following issues were raised:

◦ Quarterly repayments

The main issue that was raised was the requirement to pay back loans on a quarterly basis required a higher than necessary level of administration. In addition, there were concerns that when the first payment was due, projects may not have been running for long enough to realise any savings. One example of this would be if a new heating system was installed in the summer, repayments would be required before the system was used. There was a suggestion that repayments should be made on an annual basis instead.

◦ Five year minimum payback

Concerns were also raised that the five year payback period was too restricting for local authorities who had made a lot of progress in the past and would increasingly become a problem in the future, as high payback projects would be implemented first. Extending the payback period could also increase the numbers of renewable energy projects, as they would benefit from a more flexible payback schedule.

Barriers

In addition to the barriers raised above, several energy managers mentioned that it was difficult to get managers or senior staff to buy into CEEF, as some staff were concerned that if they can save 10% off energy bills through implementation of a project, their finance department will take this 10% from their budget. There was also some uncertainty about what would happen to the financial savings generated once the fund has been repaid; some were concerned that the finance department would take the savings and place them into a communal pot of money for the entire council, therefore the department in question would get no benefit.

Support from the Scottish Executive

The Scottish Executive has provided Fund Guidance, the CEEF software authorization system, a local authority energy toolkit and a series of targeted CEEF workshops. The Executive also provides support in response to individual requests.

All those interviewed said that the support given to them from the Scottish Executive has been good, and that the Scottish Executive are always very quick to respond to any queries they have. Now that the scheme is up and running, start up issues have largely been resolved. The website is easy to use and a good source of information; one energy manager said they use it to get ideas for projects. Some initial teething problems with the website were mentioned, such as an issue with submitted forms being duplicated, but these have mostly been ironed out. The only area raised was that of the lack of clarity of some of the information on the website, such as the way in which the dates relating to the projects should be completed: some guidance was thought to be useful.

Support from the Carbon Trust

The Carbon Trust has provided support to local authorities in the form of Multi Site Assessments and through its Local Authority Carbon Management (LACM) scheme. Under Multi Site Assessments the Carbon Trust carries out surveys at a sample of sites in order to obtain an overview of energy saving opportunities that exist across the authority, and hence identify the strengths and weaknesses of energy management practices, helping the authority to make savings across all operations. LACM is a higher level, more strategic activity which aims to provide a systematic analysis of a local authority's carbon footprint, and to lead to the development of a structured action plan for carbon savings.

A mixture of views were expressed on multi site assessments. Some raised concerns that the multi site assessment report was too generic and insufficiently detailed. There was also a comment that the Carbon Trust believed the advice they gave could be replicated across all the local authority's building stock; however, this is not possible due to wide variety between buildings. It was also mentioned by one local authority that they had expected their multi site assessment report to be something which they could use to specify equipment and criteria to contractors, but that this wasn't the case. One local authority felt the multi site assessment was very useful, and they were looking forward to having more conducted.

Overall opinions

Overall, all those interviewed felt CEEF was a positive fund. On a personal level, they felt it has opened up more opportunities for energy officers, and has led to projects which would never have been implemented before. One energy manager mentioned that due to the success of CEEF, their local authority has now set aside funds to help offset CEEF – if a project is identified that has a payback of longer than five years, the local authority will make up the difference so that the project will meet the payback criteria.

6 Assessment methodology: limitations

This section discusses some of the limitations inherent in the approach adopted for the evaluation, explains how they have arisen and makes recommendations as to how they could be addressed in the future.

6.1 Summary of the approach adopted

The methodology used for this interim assessment of the impact of CEEF both now and in the future is discussed in detail in Appendix 3. This has followed, where appropriate, Defra's guidance: Greenhouse Gas Policy Evaluation and Appraisal in Government Departments, April 2006, which is in turn based on the Treasury Green Book.

Data quality

Project submissions to CEEF are carried out electronically through a web-based system which is available to all local authority applicants. Applicants are required to enter project details including costs and estimated energy savings (and hence financial savings). Projects which meet the eligibility criteria are then automatically approved. The pre-defined criteria within the web-based systems ensures that consistent data is collected for each of the individual projects.

An external consultant independently checks the quality of the data within the web-based system. Regular reviews are carried out on the progress of CEEF and the projects submitted. This enables progress to be tracked and data quality issues to be identified and corrected.

6.2 Data limitations

The main limitations of the approach adopted concern:

6.2.1 Uncertainty over the project start date

This interim assessment has based its understanding of the impact of CEEF on the information currently held on project submissions, including that on predicted energy savings. This requires an assessment of when the project started and how long it ran for.

The applicants are asked to fill in three dates on the CEEF website:

Project committed date – when the local authority commits to implementing the project

Project spent date – when the funding has been spent

Project implemented date – when the project has been implemented and savings should begin.

An assessment of how these dates were entered by applicants was made and the results shown in Table 5. The dates entered by the applicants have not been used consistently in completed application forms. A number of submitted application forms had the same value for all three dates – others did not have dates for implementation.

Table 4 - Analysis of Dates Entered on Applications

Status of dates	Number of Projects
All three dates the same	57
Implementation date left blank	242
Implementation date entered correctly	238
Total	537

There is therefore uncertainty from the information available from the CEEF website whether successfully submitted projects:

- Are fully implemented
- Have been delayed or cancelled due to unforeseen circumstances.

This means that there is uncertainty about the lifetime of the savings arising, and in some cases whether the project has actually taken place.

How addressed in this evaluation

The accuracy of dates was checked for the six projects investigated in detail. Three of the projects had been successfully implemented and three remained incomplete. However the committed, spent and implemented dates had only been input for one of the projects. The three dates had not been input for any of the other projects including two completed projects. In regard to the incomplete projects, discussion with the local authorities suggested that these projects would go ahead, so as a minimum it would be expected that the committed dates for these projects could be input.

In addition to the dates above, the CEEF website automatically generates a project submission date, when an application is submitted. This is the date that the Scottish Executive indicates can be used as an indication that the project has, or is about to be implemented. In view of this, the “project submission date” is the only date that is provided in a consistent manner and it has therefore been assumed that energy savings start at this point and persist for the average lifetimes (listed by technology) given from the CEEF website. The data suggests that this is the most reliable approach to take, but it is likely to lead to overestimate savings.

Recommendations for the future

It is suggested that additional guidance is supplied so that the applicants provide information on when projects have been implemented in a consistent manner. At present this is not the case, as is shown in Table 4 above. It is also suggested that annual reports are made by the key local authority contact to provide an ongoing picture of savings achieved.

6.2.2 Predicted savings

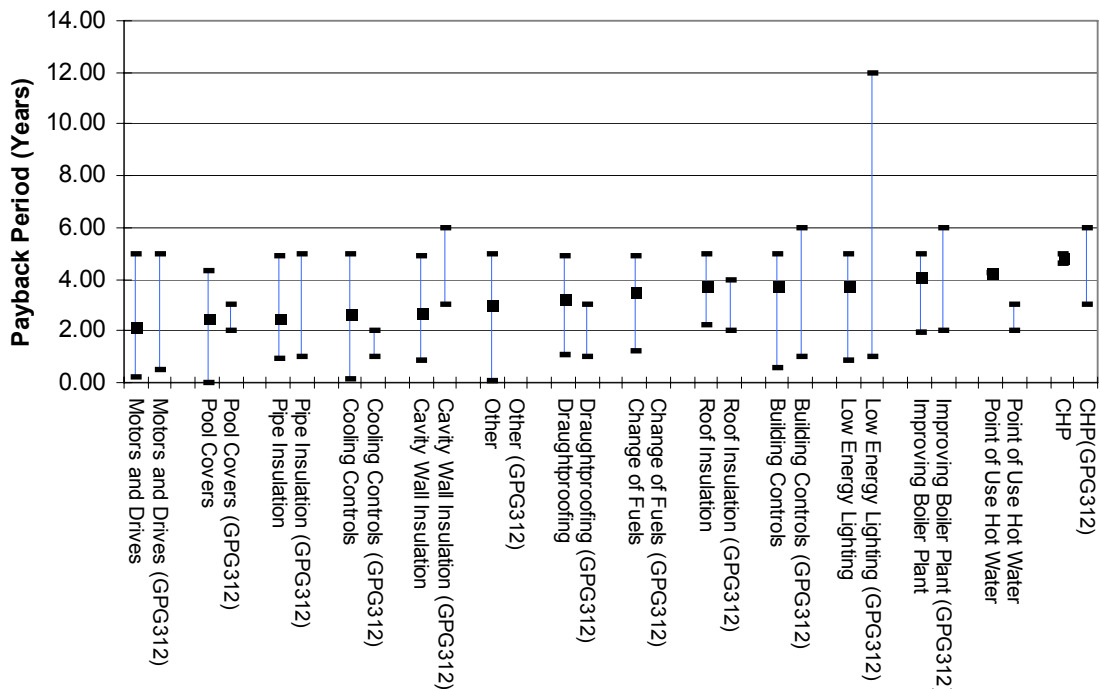
This interim assessment is based on predicted savings, rather than measured data or estimates made after the project has been carried out. In a number of cases where the projects have been implemented it is currently too early to judge savings, as the projects have not yet given rise to savings over a sufficient time period for an accurate assessment to be made (this is particularly true for projects which have seasonal energy use). In addition, there are practical difficulties in estimating the realised savings (for example, insufficient resolution of metered data) and a variety of approaches have been taken in the estimation of these consumption values by the different local authorities.

Any inaccuracies from these estimates will feed into the assessment.

How addressed in this evaluation

To provide a sanity check on the data an assessment was made of payback periods for each of the types of technology funded under CEEF. Figure 10 shows the range of payback periods calculated within the completed application forms for each technology type and compares this with published information on typical paybacks (The Carbon Trust Good Practice Guide: GPG312: – Invest to Save: Financial Appraisal of Energy Efficiency Measures across the Government Estate). This is indicated by the minimum, average and maximum values. The wide range of payback periods can be attributed to the large variety of equipment in each technology type and to the variety of building types the projects have been installed in.

Figure 10 - Range of Payback Periods within CEEF Applications



The following table further compares these quoted payback periods and then compares them with an expected range of payback periods as presented within GPG 312. It is important to note that the simple payback period depends on the cost of the fuel at the time – the latter paybacks were based on data assembled over a ten year period, and the fuel prices may therefore differ from today’s. In addition the data in GPG312 shows a wide range of possible projects, some of which would have been rejected from CEEF as the payback periods exceed the CEEF five year limit. It is therefore not possible to draw quantitative conclusions from this comparison, other than to note the data seems broadly consistent.

Table 5 – Comparison of quoted CEEF Payback Periods with standard data

Technology	Average Payback	Range of CEEF Paybacks	Range of Stated GPG 312 Paybacks
Motors and Drives	2.2	0.2 to 5	0.5 to 5
Pool Covers	2.5	0 to 4.3	2 to 3
Pipe Insulation	2.5	0.9 to 4.9	1 to 5
Cooling Controls	2.7	0.1 to 5	1 to 2
Cavity Wall Insulation	2.8	0.9 to 4.9	3 to 6
Other	3	0.1 to 4.9	-
Draught Proofing	3.2	1 to 4.9	1 to 3
Change of Fuel	3.5	1.2 to 4.9	-
Low Energy Lighting	3.7	0.8 to 5	1 to 12
Building Controls	3.7	0.6 to 5	1 to 6
Roof Insulation	3.8	2.2 to 5	2 to 4
Improving Boiler Plant	4.1	1.9 to 5	2 to 6
Point of Use Hot Water	4.2	4.2	2 to 3
CHP	4.8	4.6 to 5	3 to 6

This showed wide ranges of behaviour which were nevertheless consistent with those observed by a range of other studies, and can reflect variations in project parameters as well as data analysis approaches.

Further to this, a number of individual projects have been evaluated in greater detail. This has enabled comparison in some cases of before and after estimates, but in the main this was not possible as the projects had only recently been commissioned. In addition it must be borne in mind that for most, dedicated sub-metering was not available and instead it was necessary to calculate estimates, usually by consulting derived data based on modelling. The methodology adopted was considered sound but a detailed assessments of outcomes was not possible at this stage.

Some further advice or guidance on how the implemented savings should be estimated is likely to be beneficial, and will ensure a more consistent approach to the estimates.

Recommendations for the future

It is suggested that applicants be required to provide information on the actual energy reductions obtained in subsequent years after project completion, together with the methodology used. This could be carried out as part of an annual reporting process. This would considerably increase confidence in the data.

6.2.3 Project lifetimes

When assessing project savings it is necessary to estimate how long the project will operate for. Estimates are available of the lifetimes of the technologies supported by CEEF, as shown in Appendix 3, and these have been used in this evaluation. Clearly there will be individual variation around these figures. Nevertheless, it is not clear if projects will run for the full technology lifetime, or whether this will be cut short, for example if the building they were installed in closed.

How addressed in this evaluation

It has been assumed that projects persist for the average technology lifetimes.

Recommendations for the future

In future assessments of the impact of CEEF it would be appropriate to test how long projects have continued to operate for and to compare this with the technology lifetimes.

6.2.4 Future projects

An assessment has been made of the savings arising from existing projects. However, the number of projects is increasing with time, and this will clearly increase the impact of CEEF. Therefore additional estimates have been made of the likely level of potential future projects, based on the current rate of project submission, and on the average payback, capital cost and energy and carbon savings per project. Clearly if this changes in the future, any inaccuracy about the assumptions will influence the accuracy of the results.

How addressed in this evaluation

The estimate of the number of likely projects was compared with the actual number at the end of December. This showed good agreement – however, this is over a short timescale so will not reflect any changes in how the local authorities promote CEEF. For example, those local authorities who have made least progress are understood to be developing action plans to increase uptake of projects: this could result in a significant increase in the number of projects.

Recommendations for the future

CEEF has operated for a relatively short period of time, during which the rate of uptake has increased significantly as awareness of the fund has grown and teething problems have been overcome. Nevertheless there is still a wide variation in uptake between local authorities. If some of the local authorities who have made relatively little progress to date are able to take full advantage of CEEF this could substantially increase the rate of project uptake. At the same time, as the fund progresses some local authorities may find it more challenging to develop projects within the five year payback criterion. Nevertheless, future evaluations will have a longer period of fund operation to draw on, during which these issues may be clearer.

7 Putting the scheme in context

Of other initiatives which currently address energy efficiency in local authorities two are particularly relevant – the Central Energy Efficiency Fund operating in Northern Ireland and Salix’s “Invest to Save” revolving fund. This section considers these schemes, in particular considering whether there are any best practice options and lessons that can be learnt from their operation.

7.1 Central Energy Efficiency Fund Northern Ireland

7.1.1 Funding Methodology

The Central Energy Efficiency Fund in Northern Ireland has been in existence since 1993 and is operated by the Department of Finance and Personnel Northern Ireland (DFPNI) to provide support for energy (and later carbon dioxide) saving measures which could not be financed from within Departmental budgets. The scheme, on which CEEF in Scotland is based, provides a source of funding for NI public sector bodies to purchase energy efficiency equipment and/or to carry out fuel switching. Lately it has also been supporting the installation of CHP (as also has CEEF in Scotland) and renewable energy technologies. The typical fund size is £2.7 million per annum – unlike CEEF in Scotland the Northern Ireland scheme is not a loan scheme, but instead provides grant funding.

Projects are authorised when energy managers in the public sector bodies put forward proposals justifying the investment in energy efficiency equipment. DFPNI has developed CEEF software (customised for use in Scotland) which requires proposers to submit relevant information and provides an assessment of whether the proposed project will offer worthwhile savings in energy and/or CO₂ emissions. DFPNI expects other funding options to be explored first. CEEF will not support projects with a capital cost of less than £3,500 (although projects can be aggregated if appropriate to reach this figure). Initially the fund focussed solely on energy efficiency measures, but since the late 1990s renewable measures have been added. A list of the eligible categories is given in Appendix 5.

Each year (at a specific date) all proposals are gathered and considered by a working group to ensure the figures and projected savings are credible. To do this effectively it is necessary to have good energy benchmark data. To achieve this, the outputs from a supporting project, the Energy Performance Unit’s Energy Monitoring System were used, as described below. Following this sanity check, the overall benefits to project cost ratio is calculated and from this a list created of projects in order of priority. Each year the scheme is oversubscribed so only the most effective can be funded. The benefits are assessed as a combination of total energy cost savings, plus social cost of carbon together with any other cost benefits (e.g. reduced maintenance) over the projected lifetime of the project. The most effective projects are funded and usually receive 100% funding for capital costs.

Energy managers are expected to undertake post project evaluations for any projects that receive funding and detailed evaluations for all schemes with capital costs above £50,000. There is also a requirement for reports on most projects which receive Central Fund support, and selections of these are published from time to time. The current selection is available on the web (www.psecni.gov.uk).

The following aspects of CEEF reduce barriers to implementation:

- The administration aims to be easy to operate (whilst being rigorous enough to provide an audit trail);
- 100% funding means that projects do not require recipients to draw on other budgets;
- The use of an EMS provides strategic focus.

The Energy Monitoring System

Energy performance of NI public bodies has been subject to centralised oversight since the mid 1980s. To meet the requirements of the 2000 Climate Change Programme which called for the benchmarking of individual buildings, DFPNI developed an energy monitoring system (EMS). This collects energy consumption data from all of NI's approximately 3,500 sites and energy consumption centres that are operated by the public sector. The scheme, which replaced less detailed reporting arrangements previously in place, has now been running for over five years, and it provides detailed monitoring of the performance of individual buildings in terms of energy use, CO₂ emissions and cost, normalised for floor area. Almost all of the NI public sector estate has been benchmarked. While the EMS originally benchmarked against standard UK figures it now has sufficient data to establish NI norms, benchmarks etc and so performance figures reflect local costs, conditions, fuel mix etc. The EMS allows comparison between similar operations in NI and against UK average and best practice. In particular it makes possible the identification of the worst performing buildings. It also gives excellent information on energy usage and CO₂ emissions at different levels, whether for a single building, a department or building type (e.g. primary schools). "Process loads" are also included, such as street lighting, which don't relate to floor area.

In some cases there have been difficulties obtaining data from end users. DFPNI have considered withholding CEEF funding in these cases but have concerns that this might be counterproductive and self defeating.

7.2 Salix Invest to Save

7.2.1 Introduction

Salix operate an Invest to Save initiative in England and Wales. This enables Local Authorities to set up ring fenced pools of funds. To date the average fund size is just under £400,000 per local authority. Salix provides up to half of the fund with the Local Authority matching this as a minimum. Salix sees this as a way for the local authorities to in effect double their funds. The Salix money is paid over two years in six monthly instalments, although these can be front or back end loaded to meet the needs of the local authorities. The funding is a 'repayable grant' in the sense that Salix reserve the right to recover it, for example if the local authority runs out of projects.

Local authorities are able to borrow some of their funds from the prudential borrowing regime under which local authorities are now free to borrow for capital investment without having to seek permission from Government, subject to this being prudent and affordable. This can however cause a problem as the fund must be kept in balance i.e it can't make a loss – in addition it may then be necessary to extend the loan to a longer period before the local authority benefits from the savings. The use of Prudential Borrowing is not a preferred route due to the additional complexity of keeping the ring fenced fund in balance.

The Local Authority then uses the ring fenced funding as a revolving loan fund for compliant capital projects. Repayments are used to provide funding for subsequent projects so the aim is to set up a long term, sustainable fund. Projects must relate to proven energy efficiency technologies, drawing on details given in the Carbon Trust's GPG 312. Some individual measures have been approved in addition, such voltage reduction – and it is open to local authorities to propose other options. Eligible projects must meet either of two sets of criteria:

- Energy efficiency projects must have a payback of 5 years or better and a lifetime cost of CO₂ emissions of £100/tonne¹ (£367/tC) or better.
- Other eligible projects (e.g. renewables) must have a payback of 7.5 years or better and a lifetime cost of CO₂ emissions of £50/tonne (£183/tC) or better.

In practice, many of the energy efficiency projects also meet the £50/tonne (£183/tC) criterion.

¹ This represents the capital cost of the project divided by the Carbon Dioxide savings delivered per year multiplied by the persistence factor for the particular technology.

7.2.2 Measures Supported

The projects implemented so far cover a wide range of buildings, in particular including schools, leisure facilities and corporate buildings. Popular technologies include lighting, pool covers and heating controls, although as the latter have shorter lifetime savings, Salix are tending to steer applicants to more promising options.

Impact assessments carried out to date have looked at the first 401 projects implemented, which have resulted in a cost of carbon saving of £369/tonne/annum CO₂² (£1354/tC/annum), with an average payback of 3.5 years. A wide variation in projects and cost effectiveness has been seen. In addition, as energy costs increase, technologies which would have been ignored become financially feasible and more attractive.

7.2.3 The scheme in practice

Salix have found that the biggest issue to date has been availability of adequate resourcing. The Salix approach provides additional funding to that within the local authorities: however these resources do have to be made available to market the scheme, identify projects and deliver the approved schemes.

Piloting the scheme started in the autumn of 2004. Like CEEF, Salix have found that it can take some time for local authorities to get up and running with the scheme and the draw down of funds for some of the pilot authorities is currently running around 6 months behind the original schedule.

Salix have introduced the following measures to address the issue of barriers to uptake.

High level commitment

Salix actively seek out a sponsoring director within the local authority who is committed to the scheme – it is expected that the person running the Salix fund will report to them and hence they will have an incentive to take the scheme forward.

Spend based targets

Since the pilot phase Salix have introduced a process of spend based targets – so that if a local authority does not achieve the six monthly targets then Salix can recover future funding earmarked for the authority. This would be applied in a gradual way such that missing the first six month target would be regarded as a warning sign but missing the second would result in withdrawal of all future grant payments.

7.3 Comparison of CEEF projects with CEEF NI and Salix

A comparison has been made on a project basis of the relative cost effectiveness of CEEF with projects supported by CEEF NI and Salix. This is shown in Table 6

Table 6 – Comparison of CEEF

	CEEF NI	CEEF	SALIX
Average Payback Period	2.9	3.2	3.5
Cost/t Carbon	£641	£1,205	£1,354

It would be expected that Northern Ireland would have a lower payback period as they are not able to fund all projects submitted and so presumably select the most cost effective. The increase in cost effectiveness of carbon abatement there arises due to their use of high carbon fuels. In The Northern Ireland Energy Study (covering 2002) it stated that electricity generation in Northern Ireland was relatively inefficient. Primary fuels were mostly higher carbon fuels (coal and oil) and there was relatively little renewable energy. Although it is expected that the carbon footprint improved by 2005/06 it is still understood to lag behind the UK.

² Calculated from the average annual capital cost of all projects divided by the annual Carbon Dioxide savings.

Finally, it must be noted that a comparison of the overall programme cost effectiveness has not been made: CEEF is intrinsically low cost as it is a loan scheme, with automatic project approval system and low overheads. By contrast the other schemes are both grant rather than loan schemes and both require project approval procedures to be carried out by the parent bodies.

8 Issues and options

It is clear from the analysis presented over the previous sections, that CEEF has achieved considerable successes in the relatively short period since it was set up. Over 500 projects have been instigated, and lifetime energy savings of over £20 million, or 80,000 tonnes of carbon will arise if these are successfully taken through to completion.

There are considerable variations between local authorities in the extent to which they have made use of their CEEF allocation and developed projects. There have been substantial increases in project implementation over the life of the fund to date. Some local authorities have made much more use of the potential benefits of the fund than others. This section draws on understanding gained on the operation of CEEF in practice and considers options for developing CEEF further.

8.1 Identifying projects

Local authorities have the freedom to set their own approach to identifying projects. This has resulted in a wide range of strategies, ranging from focusing on the building with the largest energy consumption to drawing on the results of monitoring and targeting systems to address the worst performing buildings, regardless of their energy consumption. There is some evidence that some of the local authorities are drawing on the information available on the CEEF website to help them to develop potential project ideas.

Greater Strategic Direction for more effective projects

There may be a benefit in increasing the strategic direction of the project selection, to encourage the most effective options to be developed. Different routes could be envisaged for this. Both Salix and CEEF Northern Ireland employ central evaluation and approval of projects. However, this is not the only model – CEEF Northern Ireland in particular has built up a sizeable energy monitoring system for the public sector in Northern Ireland. This enables the Northern Ireland public sector to establish realistic benchmarks for its public building stock and hence ensure that measures supported under CEEF are cost effective. Establishment of a similar system in Scotland could prove valuable in informing project selection and need not imply central control. Indeed this is an option which is already receiving some interest within the Scottish Energy Efficiency Officers Network. It is also important to consider whether there are benefits in strategic direction from those local authorities engaged in the Carbon Trust's Local Authority Carbon Management programme that could feed into CEEF, especially as this is rolled out to increasing numbers of local authorities.

8.2 Setting up projects

Agreeing potential projects with budget holders, heads of department and building managers can take a great deal of effort. This can substantially slow the agreement and implementation of projects and reduces the recycling of the available funds. However, it is clear that this is less of an issue in some local authorities than others, and that several factors can contribute to making this easier:

- **High Level Support for CEEF**
It is clear that if the chief executive is strongly behind CEEF, and has taken action to remove barriers to its deployment, this can make it considerably easier to progress projects. In some local authorities high level support means that the energy officer can inform those concerned of the potential developments rather than having to seek permission for every project.
- **Fund Payback**
Concerns have been raised that there is a perception that if a department achieves a reduction in its energy bill, its budget will be cut – thereby removing a major incentive for managers to support CEEF. This can be exacerbated by the current requirement for quarterly repayments – as this can

require repayments before projects have produced energy savings (especially for seasonal projects relating to space heating). Some local authorities have reduced concerns relating to CEEF repayments by repaying the funds from central budgets rather than from individual department or facilities budgets – however, although this route offers both simplicity and reduces barriers to take up it does not seem to be common.

Easing the Route to Project Set Up

Maximising the take up of the CEEF fund is one of the most effective means of increasing cost effectiveness and it would therefore be worth addressing the issue of barriers to project implementation.

This should be carried out in conjunction with local authorities as they differ strongly and it would not be appropriate to try to make one solution fit all.

However, our consultation with local authorities indicates it is key to gain high level commitment to reducing barriers to CEEF if the path to efficient project take up is to be smoothed. It is therefore suggested that the Scottish Executive engage at the highest level with the local authorities to bring chief executives or directors on board. This has obviously taken place in the past, but there may be changes in personnel with time, and it would therefore be useful to revisit this. Given the considerable variation in local authority performance it would be most appropriate to focus on the local authorities who have made least progress with CEEF. However, it should be borne in mind that some local authorities (e.g. North Lanarkshire) have made good progress but still find the project agreement process very time consuming – so even local authorities who have achieved a good level of project implementation may benefit from this.

8.3 Future evaluations

This interim evaluation of the impact of CEEF has used estimates of potential future energy savings, made by applicants on project submission. It would be desirable to require applicants to provide additional information on actual energy savings achieved, perhaps as part of an annual review. This would increase the robustness and accuracy of future evaluations, by providing a clearer picture of how long projects are operational for and how much energy they are saving.

8.4 Terms and conditions

In general no major issues were raised about the CEEF terms and conditions, apart from:

Repayments

Without exception those consulted viewed quarterly repayments as undesirable. There would be considerable support for replacing these with an annual payment. This would in principle reduce the amount of money available to fund projects, but at the moment there is sufficient funding available and this would not be an issue: if take up increased this could be reviewed.

Payback criteria

A number of local authorities expressed concern that a payback limit of five years would restrict project choice, either for local authorities that had been pro active in the past, or for increasing numbers as they implemented more projects. It may be worth considering relaxing the payback criteria for local authorities who have already used their full initial CEEF allocation. Another option is the dual approach to criteria used by Salix which provides a focus for the more cost effective renewable technologies.

8.5 Support from Scottish Executive

Local authorities were very positive about the support provided by the Scottish Executive. No major omissions were identified. It was however thought that there were a few minor issues which could be clearer relating to inputting data on the CEEF website:

Project dates

There are currently three dates that the user specifies: project committed date, spent date and implemented date. Some users thought it would be good to give guidance concerning these – and looking at the data provided it is clear that they are being either not fully completed or in some cases completed incorrectly. It would be worth clarifying this, and in particular if it is possible to update the information – for example if a project start date is delayed. More accurate information in this regard would enable more accurate estimates to be made of resulting savings.

Floor area/volume

The applicant is asked to specify floor area or building volume on the form, but is not able to say which they are specifying. It would be useful to make this clearer – again this would be useful when evaluating the impact.

Actual savings

It would also be worth considering requiring applicants to supply information on actual energy savings achieved after project implementation, to feed into evaluations of CEEF in the future.

8.6 Support from Carbon Trust

The Carbon Trust has supported all but one of the 32 local authorities through the provision of a wide variety of services including:

- Carbon Management Programme
- Initial Opportunities Assessment
- Specific Opportunity Assessment
- Design Advice
- Multi Site Assessments

The form of Carbon Trust support most often mentioned by those contacted was multi site assessments. At the time of this evaluation, 21 authorities had undergone at least one multi site assessment, with five of these having had two. The energy officers clearly had mixed views on the benefits of these – and in some cases concerns that they were insufficiently specific or detailed. However, one local authority in particular did find theirs very valuable. They were at an earlier stage in progressing CEEF than many others and it may be useful to consider whether multi site assessments are of particular value in these circumstances or whether there is scope to increase the level of detail.

Some staff in local authorities reported being confused by the relative roles of the Carbon Trust and the Energy Saving Trust – they also commented that there would be benefits to greater visibility of Carbon Trust support in local authorities – that although they are well known to the energy officers, that was not the case overall.

9 Conclusions

An interim evaluation has been carried out of the Scottish Executive's Central Energy Efficiency Fund. This suggests that after an initial lead time as the scheme got underway the number of projects is increased and around 400 new projects are being supported each year.

The projects submitted to date will result in lifetime savings of £22.9 million, 1091GWh and 80,451 tonnes carbon. These results are substantially less than the original aspirations of the Scottish Executive. However, these were extremely ambitious (and in some respects inconsistent) targets and were impossible to be met given the available levels of investment from CEEF. Further, if project submissions continue at their current rate, by 2010 lifetime energy savings will amount to over £103 million, 5,253GWh and over 390,000 tonnes carbon. These are excellent results.

The average lifetime project carbon cost effectiveness, on the basis of the CEEF contribution alone is £66/tonne. On a project by project basis, CEEF achieves comparable payback (3.2) to similar schemes CEEF Northern Ireland (2.9) and Salix (3.5). Concerning carbon emissions, costs/tonne/annum range from £641 (CEEF NI), £1,205 (CEEF) to £1,452 (Salix). The NI scheme is more cost effective in reducing carbon emissions because NI consumes more high carbon fuels. However, it is important to note that these comparisons are on a per project basis: because CEEF is a loan fund, however, these capital costs are repaid and so this is not a real cost to the fund.

This study has shown that many local authorities have implemented a sizeable number of projects. However there is considerable variation between local authorities and a few of the largest energy users have made little progress. There is also considerable variation between local authorities as to how easy it is for energy managers to agree and authorise projects. Some authorities have made excellent progress, despite their procedures requiring considerable consultation before projects can be taken forward.

There is wide variation between local authorities in how projects were selected and in the sort of technologies installed. Some draw on monitoring and targeting systems to select large or inefficient energy users, some focus on optimising payback. Building controls and draught proofing are the most common projects (although not the most cost effective).

There was considerable support amongst local authorities for CEEF in its current form and enthusiasm amongst energy officers for how it had enabled them to take projects forward.

Looking forward, CEEF has built up a considerable momentum in most local authorities and although modifications to the scheme should be considered, care should be taken not to introduce disruptive changes. However, particular areas where developments could be considered are:

- **Developing a more strategic direction for project selection**, perhaps by supporting the construction of a Scottish benchmarking system, and by drawing on any lessons from the Carbon Trust's LACM programme.
- **Smoothing the way to easier project set up**, by encouraging high level commitment.
- **Changing from quarterly to annual repayments**
- **Considering revising the payback criteria**, particularly for local authorities who have made substantial progress.
- **Requirement for additional reporting**, (perhaps annual reporting, and requiring minor modifications to the CEEF web site) to enable more accurate evaluations of the impact of CEEF in the future, and to improve clarity of how dates should be entered.
- **Reviewing the use of Carbon Trust multi site assessments**, in conjunction with the local authorities to ensure they meet the needs of the local authorities.

- **Regular updates sent to chief executives on local authority performance**, to encourage high level participation and support for CEEF.
- **Clarify that CEEF money should be ring fenced**, to alleviate concerns in user departments that budgets would be cut as a result of the savings generated and that the savings would be appropriated by the finance department.

The use of a loan fund presents a very effective model – unlike grant funds requiring contributions from the local authorities themselves it does not present resourcing problems to the local authorities. At the current rate of progress by 2010 the fund will have invested about £25 million in energy saving technologies. Nevertheless due to its rolling nature, a further £6 million will still be available to fund energy saving projects, which would give rise to substantial savings. Optimising the scheme could help realise these savings and ensure CEEF produces the most effective and cost effective results.

Appendices

Appendix 1: Thanks to those consulted

Appendix 2: Details of projects analysed in depth

Appendix 3: Assumptions underlying the calculation of savings

Appendix 4: CHP savings anomaly

Appendix 5: CEEF NI: eligible projects

Appendix 1 Thanks to those consulted

A number of people have been most helpful and contributed time, information and ideas to this evaluation. Ron Hill's contribution in co-ordinating a workshop of energy officers was particularly helpful. Thanks are due to:

Graham Campbell	South Lanarkshire Council
John Douglas	Renfrew Council
Alex Gibson	Dundee Council
Richard Cebula	Edinburgh Council
John Currie	Dumfries and Galloway Council
Roger Hawes	Salix
Ron Hill	North Lanarkshire Council
Alan Lamb	North Lanarkshire Council
Andrew Marnie	South Ayrshire Council
Hugh Paton	North Ayrshire Council
Forbes Reid	Fife Council
Fiona Roche	Glasgow Council
John Stocks	The Carbon Trust
Ray Turner	Department of Finance and Personnel Northern Ireland

Appendix 2 Details of Projects

Detailed evaluations were carried out of six projects:

- Dundee City Council Improving Boiler Plant at St John's High School
- North Lanarkshire Council Low Energy Lighting at St Maurice's High School
- Glasgow City Council CHP at the Museum Repository
- Glasgow City Council Roof Insulation at the Museum Repository
- South Lanarkshire Council Building Controls at Council Headquarters
- South Lanarkshire Council CHP at Leisure Centre

Details of these are summarized below

Project 1 – Dundee City Council Technology Category – Improving Boiler Plant at St John's High School

As part of a £11m major refurbishment of the School, £151,000 of CEEF funding was used to upgrade heating within the Iona Block from electric storage heating to gas central heating.

The main aim of this project was to save energy and the main consideration when selecting this project was that it met the five-year payback criteria. The Council's Architectural Services Department did the specification of the new system.

No specific targets were set for equipment performance but the designers were well aware of and aimed to better BRE and Carbon Trust best practice guidance. They were also aware of the energy efficient equipment available at the time and consulted the Government's Enhanced Capital Allowance Energy Technology List for confirmation. The Council's Environmental Charter obligates them to select energy efficient equipment and other standards also have to be met, such as rules set for schools by Central Government/Scottish Executive.

A feasibility study funded by the local authority was undertaken for the School refurbishment. This study covered the heating improvements in the Iona Block but did not focus on this aspect of the overall project.

The values stated for energy consumption before and after project implementation were derived from metered information. The consumption before implementation was obtained from assuming that all off-peak electricity usage was due to the storage heating in the Iona Block. The performance of the proposed system was modelled using a computer programme (Hevacomp).

Equipment was installed and commissioned in summer 2006, but the heating has only just been turned on for winter. It is therefore too early to say whether expectations for savings have been met or not. However, the Council are confident that they will meet and perhaps exceed their initial expectations.

The Council made a conscious effort to ensure that they were able to measure the savings generated by the new heating system.

The project would not have gone ahead without CEEF funding.

Project 2 – North Lanarkshire Council Low Energy Lighting at St Maurice’s High School

This purpose of this project was to carry out a complete replacement of the lighting system within St Maurice’s High School at a cost £48,000. Their main aim was to make the school more energy efficient and this would not have been possible without CEEF funding.

No formal feasibility study was carried out but the local authority staff perform their own assessment to judge the feasibility of proposed projects.

The project wasn’t based on Building Regulations or Best Practice. The driver for this work was performance – and the solution given happened to be energy efficient. However, the local authority are aware of Best Practice, so would have specified a more energy efficient solution, had the one solution being presented to them been inefficient. The Energy Technology List was used to help identify suitable energy efficient products.

The energy consumption before the lighting upgrade was derived from half-hourly metered data. To estimate the consumption of the lighting, they counted the number of light-fittings and worked out how many hours each was on daily. The same approach was taken in predicting the energy consumption after implementation.

The project is now completed and is expected to deliver the predicted savings – it was projected to result in £12K worth of savings overall, and since its completion at the end of March, it has so far brought in £4,700 worth of savings.

Project 3 – Glasgow City Council CHP at a Museum Repository

This project was the installation of a 70kW CHP engine costing £70,000 into a new build Museum Repository. This was an additional energy saving improvement to planned major building work. This enhancement of energy performance was only considered because CEEF funding made it possible.

As this was a new build, no energy consumption data was available for before installation. Consumption data from an existing building of the same specification but with standard gas heating was used to represent the energy consumption of the new building before installation of the CHP engine.

This project is proceeding and CHP is expected to be operational by April 2008.

Project 4 – Glasgow City Council Roof Insulation at a Museum Repository

This project is to install upgraded roof insulation costing £28,000 into the new build Museum Repository the CHP project above referred to. As of March 2007 work is in progress to install the insulation on site.

The energy consumption data was derived as in Project 3.

Project 5 – South Lanarkshire Council Building Controls at Council Offices

This project involved the upgrading of air-conditioning controls at South Lanarkshire Council headquarters, and had a value of £200,000, of which CEEF contributed £96,000. The aim of this project was to achieve better control of the internal office conditions, as the building was often under or over heated. They also wished to reduce their energy consumption.

This piece of work would have gone ahead without CEEF, as it would have become a priority within the local authority. However, it would not have gone ahead to the same extent, and they would have used a lower grade design.

In terms of equipment specification, they looked at various manufacturers in order to get the best possible equipment. In this sense, quality was more important than price. They wanted each floor of the building to have individual control over the heating.

A feasibility study was conducted, which considered different options for the controls. They wanted to be able to identify a system which would reduce fuel and energy use, but increase staff comfort levels. The controls decided on are electronic, whereas before they were analogue.

The 'before' energy values were derived from 5 – 6 years worth of metered data which they had available. They carried out a trend analysis on this data to get the gas and electricity consumption. For their 'after' energy values, they gave a brief to a consultant to carry out a review of their energy consumption, and to write this up in a report. Energy management software was used to help them derive all figures.

Project 6 - South Lanarkshire Council CHP at Leisure Centre

This project is to replace the CHP unit at Hamilton Water Palace, as the CHP unit they currently have on this site has nearly failed. This project is still in the design stage – at the time of the interview, they were waiting on hearing back from a consultant who was hired to investigate the viability of this project.

It appeared that this project would not be going ahead without CEEF, as it was mentioned that the project had been put off until they had secured their funding.

Appendix 3 Methodology for calculation of savings

This interim evaluation has followed, wherever appropriate, Defra's booklet: Greenhouse Gas Policy Evaluation and Appraisal in Government Departments, April 2006, which in turn is based on the Treasury Green Book.

Data on CEEF projects is based on a snapshot of the available information, taken from the CEEF projects database on 19th September 2006.

All financial savings (and capital expenditure) are expressed in terms of 2006 prices.

Projects (section 2)

The following information provided by the applicants was used directly in the calculations of savings:

Estimated energy savings
Capital expenditure
Technology of project
Project lifetime

Project Start Date

Throughout this evaluation, it was assumed that the date of submission of the project application form was the date on which the project started to realise savings. This was decided upon due to the fact that the project implementation date was often left blank or the accuracy of the input figure was questionable. The project submission date is automatically generated for every project when the application form is submitted. The Scottish Executive suggested that once a project is submitted they would expect the project to be implemented within a short period of time.

To investigate the cost-effectiveness of the different technology types, the lifetime savings for each project were calculated based on the assumed technology lifetimes for the technology (included in the data from the CEEF website download) and the annual carbon, energy and financial savings quoted for each project. The sum of the lifetime savings for each project within a technology category was then divided by the sum of the capital expenditure of each project within the same category. This resulted in the lifetime savings that would be generated per pound spent on each of the technology categories.

When calculating the lifetime Carbon, energy and financial savings generated by CEEF projects, the assumed technology lifetimes (detailed in Table 7) were used to represent the longevity of each technology. These values are the lifetimes assumed on the CEEF application form for each technology category. In Table 2, the suitability of the lifetime assumptions have been commented on by an AEA staff member with an understanding of these measures.

Table 7 – Assumed CEEF Technology Lifetimes

Technology	Technology Life (years)	Comment from AEA Energy Efficiency Advisor
Cooling Controls	10	Refer to the Building Controls commentary
Draught proofing	10	These are highly modular and can be replaced in part more regularly. These are not always replaced with other plant such as boilers, chillers etc.
Building Controls	15	These are highly modular and can be replaced in part more regularly. These are not always replaced with other plant such as boilers, chillers etc.
Low Energy Lighting	15	Lamps will typically be replaced more frequently. Whole scheme design and refurbishment will be in this region, less for specific environment..
Point of Use Hot Water	15	Very small point of use water heaters can be replaced more frequently due to lower capital

		costs.
Pool Covers	15	
Motors and Drives	15	Motors and drives include variable speed drives that are fitted to appliances such as refrigeration compressors, fans and compressed air machines. As such, this time horizon varies between specific technologies, how they are used and conditions in which they operate.
Change of Fuel	20	Change of fuel towards gas-based fuels is unlikely to revert back to other fossil fuels in the foreseeable future. It is feasible that fuel changes will remain well beyond this time horizon at present.
CHP	20	Engines typically run for around 4,500 hours per year to remain in operation for this period.
Improving Boiler Plant	20	Boiler plant includes ancillary components in the plant area such as flues, calorifiers, pumps and ancillary components such as valves and fittings. Typically, boilers can be replaced on this 20 year cyclical basis, due to the modern design of such plant, mechanical components such as fans may be replaced more frequently. The 20 year term is perceived to be the time when an major overhaul will occur that will include an evaluation of the heat demand and subsequent redesign of the heat generating plant.
Pipe Insulation	20	Pipe insulation sections can be replaced on a more regular basis specifically in areas of high risk such as plant areas where more damage is likely to occur.
Other	20	19 years is the average lifetime across all technologies. To cover the variety of technologies in this category 20 years seems appropriate.
Roof Insulation	60	All building fabric measures tend to remain in situ for the remainder of the building life, or until the next refurbishment. This can range beyond 50 years
Cavity Wall Insulation	60	All building fabric measures tend to remain in situ for the remainder of the building life, or until the next refurbishment. This can range beyond 50 years

Savings (Section 4)

The approach taken to estimating savings for projects started after the date of this evaluation was to model the fund churn as a number of average projects were implemented. These projects had the same average payback and capital expenditure characteristic of the projects implemented to date. At the same time the size of the remaining fund was estimated, based on the outflow of money to projects and the return of funds through repayments. The parameters used to model CEEF into the future were as detailed in Table 8.

Table 8 - Modelling Parameters

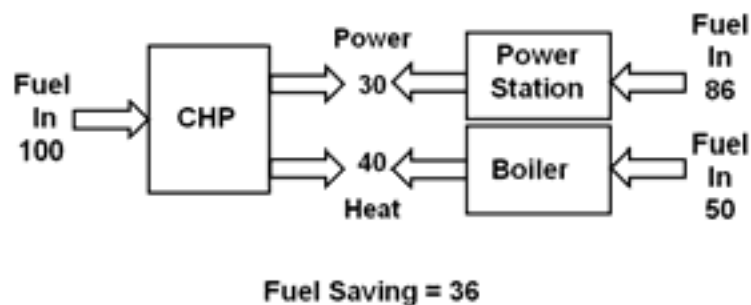
Parameter	Value
Average Capital Cost of a Project	£9,943
Average Lifetime of Project (years)	19
Number of new projects/year	Actual to 2006, then as scenario
Average Payback Period (years)	3.25
Fuel price: gas	1.8p/kWh
Fuel price: electricity	5.8p/kWh
Fuel split % gas	65%

Appendix 4 – CHP Savings Anomaly

CHP is the simultaneous onsite generation of electricity and heat from a primary fuel such as gas or coal. CHP avoids the losses incurred in the transmission of electricity from conventional centralised power stations. In addition when electricity is generated centrally a substantial quantity of energy is wasted as unwanted heat – whereas CHP plant makes use of the heat produced in electricity generation. Therefore, when there is a good use for the heat, CHP consumes less primary fuel per unit of delivered energy than if using a combination of imported gas and electricity. Hence CHP also reduces CO₂ and other emissions from primary fuel use.

Figure 11 illustrates the saving for a notional CHP scheme that supplies 30 units of power and 40 units of heat to an energy user.

Figure 11 - Primary Fuel Savings using CHP



The information submitted to the CEEF website only considers the delivered energy relating to CHP, and so does not correctly reflect the primary energy savings arising from the use of CHP. If the notional scheme illustrated above had been the subject of a CEEF application the data available to an assessment would have shown an increase in energy use of 20 units (Fuel in to CHP less the power used and less the fuel in to the boiler = 100 – (30+50)). Whereas the true primary energy saving is 36 units.

Based on a conversion factor of 2.58, the electricity consumption quoted in the application forms can be converted to primary fuel consumption. This results in the calculation of more appropriate savings figures for the two CEEF CHP projects as shown in Table 9

Table 9 - Adjusted Energy Savings

Project	Annual Energy Saving as Quoted in Application Forms (kWh)	Adjusted Annual Energy Saving (kWh)
CHP 1	-187,902	429,744
CHP 2	-181,000	3,811,325

The financial and carbon savings presented for each of the CHP projects are calculated within the application form based upon the entered energy consumption data. Therefore, these savings will also be affected by the issues discussed above.

Appendix 5 CEEF NI Eligible Technologies

- 001-BEMS/EMS/Boiler or Heating Controls/TRVs
- 002-Refrigeration or Air Conditioning Controls
- 003-Lighting Controls or Conversion to Low Energy Lighting
- 004-Change of Fuel (Electricity>Oil>LPG>Nat Gas)
- 005-Installation of CHP
- 006-Point of Use Domestic Hot Water Heaters
- 007-Boiler Plant Upgrading or Decentralisation
- 008-Heat Recovery Including Destratification Fans
- 009-Radiator Reflective Panels
- 010-Roof Insulation
- 011-Cavity Wall Insulation
- 012-Pipe Insulation or Valve Covers
- 013-Draught proofing
- 014-Double Glazing/Secondary Glazing
- 015-Swimming Pool Covers
- 016-Renewable Energy - Wind
- 017-Renewable Energy - Hydro
- 018-Renewable Energy - Biomass
- 019-Renewable Energy - Solar Heat
- 020-Renewable Energy - Photovoltaic
- 021-Renewable Energy - Ground Source Heat Pump