University College Dublin

Energy Policy and Strategy

2008-2012

Design: Media Services, UCD IT Services

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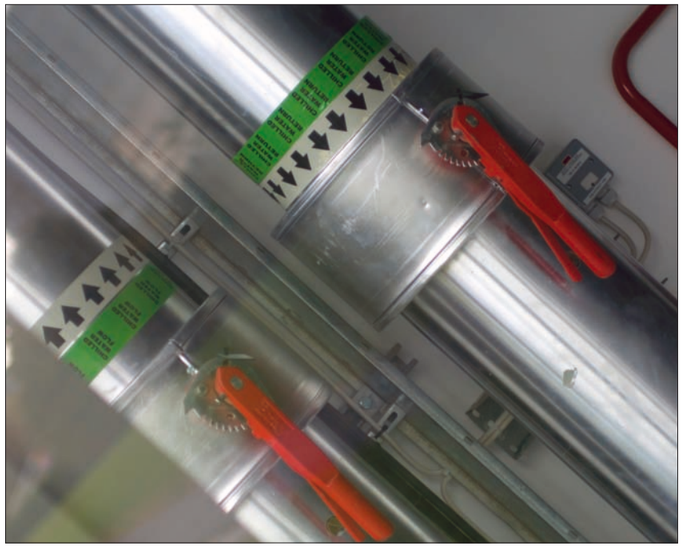
1 Energy Management

In 2003 UCD published an energy policy which set forth a goal of achieving a 10% energy saving by 2010-2012, with an interim goal of achieving 10% saving in selected buildings by 2006. This resulted in a number of important initiatives:

- The formation of a dedicated Energy Unit within Buildings and Services Department.
- The development and roll out of a web-based energy monitor ing and reporting system for each building.
- The establishment of the **e³ Energy Management Bureau** in conjunction with Dublin Institute of Technology, Dublin City University and Trinity College Dublin.
- Implementation of a range of energy efficiency projects.
- Feasibility studies on a number of renewable energy technologies–wind power, geothermal energy, biomass.



The primary objective of this Energy Policy and Strategy is to give practical effect to the vision of the UCD Belfield Campus as a model of energy sustainability. It sets performance goals for UCD in the period 2008–2012 and identifies a suite of activities through which these goals will be achieved. It builds on the 2003 energy policy and subsequent initiatives and establishes a framework for new building design, campus heating and electricity supply, and building operation and maintenance.

This energy initiative is also driven by financial and environmental policy considerations, both of which are more pressing than they were in 2003.

Financial considerations–In the 2007 financial year UCD spent €5.5 million on energy–power and heat – for the entire university, representing a 60% increase since 2003.

Policy–EU and Irish policies seek to promote activities that reduce greenhouse gas emissions.

The Government White Paper 'Delivering a sustainable energy future for Ireland' (March 2007) requires the public sector to lead by example, and sets a target of 33% energy savings across the public sector by 2020. It notes the need to build upon the work of the Energy Management Bureaux, of which **e³** is one.

Dún Laoghaire Rathdown County Council have issued an energy policy ET7 which signals the proposed use of the planning process to promote more sustainable development. It is intended that the energy policy and strategy set out in this document will be agreed with the Council as part of an overall framework for sustainable development on the Belfield Campus in the future.

2 University Commitment

2.1 Development Plan

The vision of a sustainable, healthy and living campus is a central theme of the UCD Development Plan 2005–2010–2015.

'A primary aspiration of the plan is the advancement and promotion of UCD as a modern university, one that excels in both academic achievement and the built environment. It is critical that the foundations for a sustainable campus are established now. This will allow the University to have strategies in place ahead of demand and regulation'.

Energy is seen as a key element of the overall sustainability goal.

2.2 Building and Services Department Commitment

'With energy costs in the University continuing to rise and national objectives to reduce greenhouse gas emissions, the Building and Services Department recognises that it has a key role to play in facilitating the reduction of UCD's energy consumption and in the procurement of more environmentally sustainable energy.

Since 2003 the Building and Services Department has been committed to halting the upward trend in energy consumption and has set a target for the Belfield campus of 10% energy saving per square metre to be achieved by 2012. Substantial progress has been made, but significant challenges remain as research activity increases and Belfield becomes a vibrant 24 hour campus. We will rise to the challenge of delivering a sustainable and living campus. We publish our overall goal, subsidiary targets, and annual progress so that the success of our commitment is open to public scrutiny.

While the contribution of all Building and Services staff toward this goal is expected, we recognise that the effort cannot come wholly from departmental activities. We will seek the support of academic staff, students and contract staff in this programme. We welcome voluntary initiatives on the part of other stakeholders to improve the energy-efficiency and reduce the emissions attributable to the consumption of energy in this University'.

Aidan Grannell,
UCD Director of Buildings

3 Goals

UCD's goal is to reduce fossil-fuel, primary energy consumption per square metre for buildings at the Belfield campus by 10% by the end of 2012. The benchmark year is 2003 for buildings built prior to that date, and the first year of operation for buildings built after 2003.

This target must be considered in light of the underlying upward trend in energy consumption per square metre of approximately 5% per annum. Simply halting this rise would be an achievement in its own right.

The Government White Paper 'Delivering a sustainable energy future for Ireland' (March 2007) requires the public sector to lead by example, and sets a target of 33% energy savings across the public sector by 2020. This is our long term goal.

We have chosen:

- Fossil fuel–to allow for the use of renewable energy technologies such as wind-generated power, solar domestic hot water or wood-fired heating plants.
- Primary energy consumption–to allow us to choose the most cost-effective mix of energy-producing technologies and energy-efficiency measures; it is neutral of energy type (i.e. heat or power); it is neutral of inflation in energy costs.
- A % per square metre–to allow for the growth in size of the institution as this is a more significant driver of energy costs than number of staff/students.
- The Belfield Campus because it accounts for 85% of energy use and is the main area of development activity.
- 10%–because we believe it is obtainable, ambitious, and consistent with national requirements.
- 2012–because this is the deadline for Ireland to comply with the Kyoto protocol.

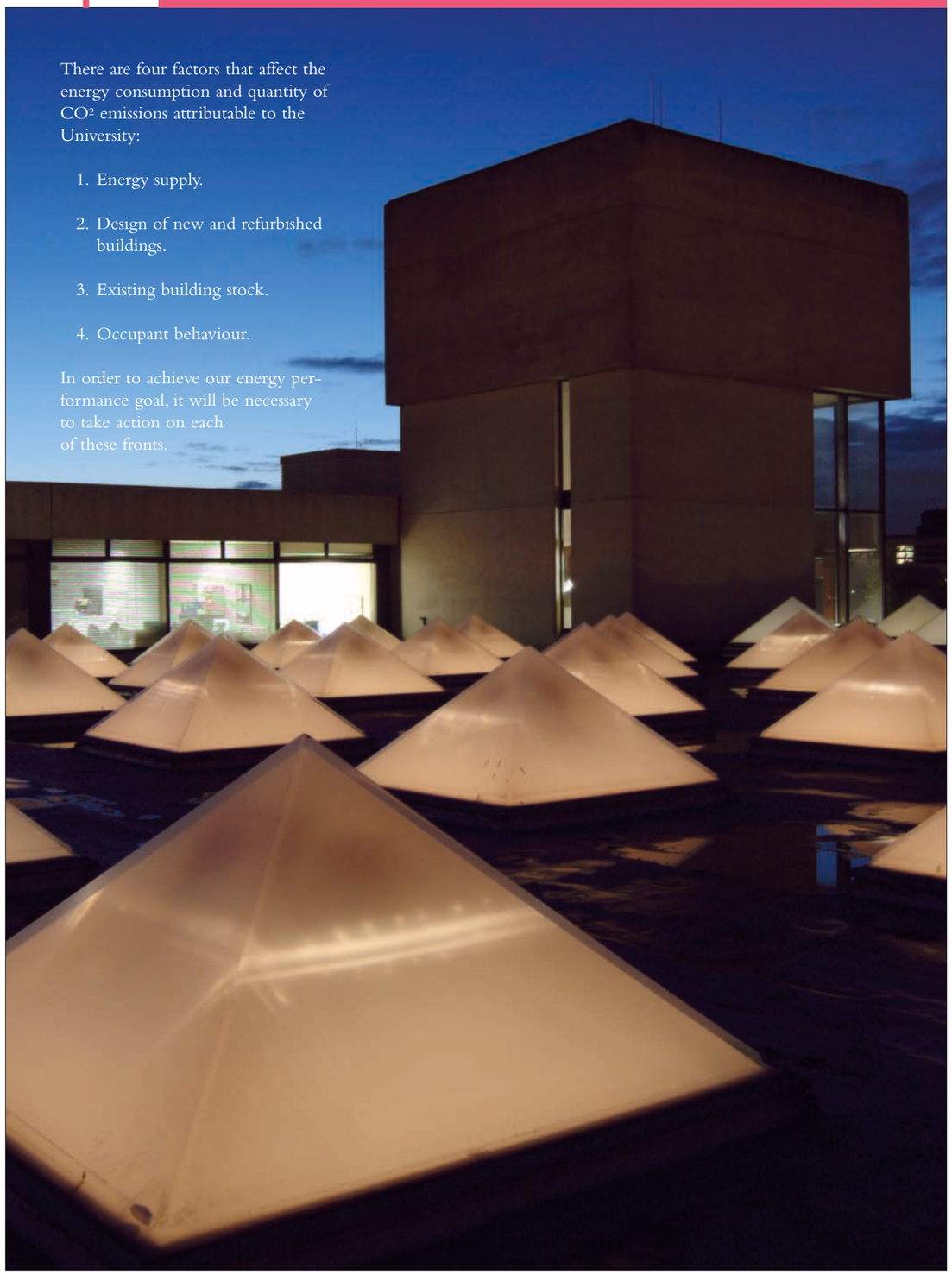
In order to track progress towards our goal the Energy Unit will produce an annual report detailing the energy performance of individual buildings on the Belfield campus and giving overall key indicators in terms of cost/m^2, % renewables and kg CO^2/m^2.

4 Direction of Activities

There are four factors that affect the energy consumption and quantity of CO^2 emissions attributable to the University:

1. Energy supply.
2. Design of new and refurbished buildings.
3. Existing building stock.
4. Occupant behaviour.

In order to achieve our energy performance goal, it will be necessary to take action on each of these fronts.



4.1 Energy Supply

UCD purchases energy in several forms–electricity, gas and heating oil. In burning the gas and oil, the fossil fuel is converted to heat energy for heating buildings and water. In conjunction with the **e³** Bureau Colleges UCD has entered into a one year contract with Airtricity for supply of renewable electricity to all premises from January 2007. In addition, the Belfield campus has a Combined Heat and Power Plant (CHP), burning gas to produce both elec-tricity and heat energies. CHP is regarded as sustainable source of energy–it makes up 27% of Belfield's total electricity but only provides 2.5% of national elec-tricity requirements.

Both the CHP plant and Energy Centre boilers supply heat to the Belfield District Heating system.

UCD has the means to further reduce energy consumption and CO^2 emissions through:

- ***Electricity***–ongoing pro-curement of electricity produced by efficient and sustainable means (beyond 2007). For instance, UCD can procure electricity generated in combined-cycle power plants, CHP plants or by wind energy. Electricity production can be ranked according to the following order of environmental merit:

  Renewables ★★★★★★
  CHP ★★★★★
  Combined Cycle Gas Turbine ★★★★
  Peat ★★★
  Oil ★★
  Coal ★

- ***Fuel type***–similar to above, the type of fuel that is used in the production of heat can also be ranked and presents the possibility of conversion of heating systems:

  Renewables ★★★★★
  Gas ★★★★
  Oil ★★★
  Solid Fuel ★★
  Electricity ★

- ***Technologies***–again, the type of technology used in the conversion of heat energy can be ranked:

  Passive Renewables ★★★★★
  Active Renewables ★★★★
  CHP ★★★
  Condensing Boiler ★★
  Conventional Boiler ★

Policy

UCD's energy policy is to: procure cost-effective and efficiently pro-duced electricity; and to favour the most cost-effective, environ-mentally friendly fuel and energy conver-sion technologies suited to the application. Due consideration will be given to the maturity and relia-bility of technologies.

Specific Actions

A number of specific actions are planned:

- Biomass boiler–A 1MW Biomass Boiler will be installed in the main Energy Centre at Belfield in 2008.

- Combined Heat and Power–the potential for additional CHP on the DH system will be examined once the biomass boiler is operational. This may involve extension of the DH network. An obvious possibility is the planned extension to the Student Centre, which includes a swimming pool.

- Solar Hot Water–a general survey, followed by specific assessments, will identify areas which are suitable to solar hot water heating. Likely areas include student residences.

- Local modulating and con-densing boilers–the potential for these boilers will be examined in all new/refurb-ishment projects. It is intended that the lead boiler will be condensing, and design will consider the possibility of dedicated low return water temperatures to maximise condensing efficiencies. Furthermore, direct weather compensated control of the boilers by the BMS, with due consideration to DHW requirements, will maximise seasonal efficiency.

- Existing boiler controls–The Energy Unit will review all existing boilers to establish if there is potential to improve seasonal efficiency through improved control.

- Identify suitable area for microCHP, the Biomedical Institute in the Conway building being one such possibility.

- Building Integrated Photo-Voltaics–monitor developments in this area with a view to implementing a trial project if the technology becomes cost-effective.

Note: The feasibility of installing a wind turbine on the Belfield Campus has also been examined. However, as all UCD's electricity is currently supplied by Airtricity and is renewable, the wind turbine pro-posal will not be advanced at the present time.

4.2 New Building Design (including major refurb-ishment)

The design of a building's fabric, form and systems represents an important aspect of the demand side of the energy equation (the other is occupant behaviour). Building design, once established, has a signif-icant bearing on the energy con-sumption of that building throughout its life.

UCD's design brief for new build-ings advocates the use of passive design principles such as maximising the use of daylighting, solar thermal shading, the use a building's thermal mass to moderate internal condi-tions, and a preference of the use of natural ventilation. The zoning of buildings can be used to help min-imise the extent of mechanical ven-tilation and installed air conditioning plant.

UCD's 'Guidelines for Designers and Specifiers' provides details of specific mechanical and electrical requirements for new buildings, including energy efficiency and sus-tainability requirements. Compliance with these Guidelines is mandated in all new building and major refurbishment design briefs. This is the mechanism by which best practice will be incorporated into new buildings.

Policy

Dún Laoghaire-Rathdown County Council's energy policy, ET7, is effective for planning applications exceeding 1,000sqm from 1 January 2008. It requires 'a collective reduc-tion of at least 40% in CO^2 emis-sions deriving from energy use for space heating, cooling, water heating and lighting…relative to a baseline of prevailing norms…Furthermore, at least 20% of space and water heating shall be from a renewable energy source…The preferred methodology for assessing the feasi-bility of such stainable energy sys-tems shall be the Sustainable Energy Ireland software tool or other acceptable methodology'. It is intended that this Energy Framework and the existing meas-ures already in place will contribute to a reduction in the CO^2 emissions requirement and entirely offset the renewable energy requirement for specific buildings. The overall strate-gy will be discussed with the Council as part of the planning process.

In the case of new (and major refurbish-ment) building design, UCD's energy policy is to:

- *Ensure all new buildings incorporate principles of energy efficiency and sustainable design.*
- *All new and refurbishment letters of appointment will mandate compliance with UCD's 'Guidelines for Designers and Specifiers' and the completion of a short Design Study report for approval by the Energy Unit prior to submission of a planning application. The Architect will have responsibility for the completion of the Design Study, with support from the M&E consultants.*

- *In the Design Study, design options will be evaluated under the following headings: building fabric; space heating and hot water production; electrical services; ventilation strategy; intelligent controls/BMS; and overall design strategy. Architects and Building Services Engineers must adopt an integrated approach to the design of the building and its M&E services in order to maximise use of daylighting, natural ventilation, thermal mass for storage and free cooling. Air conditioning is regarded as a cooling measure of last resort: its use must be justified on the basis that other options will not be adequate, and then only applied on a zoned basis.*

- *Specify BMS Metering with submetering of commercial units.*

- *All new buildings will be pressure-tested and a post-occupancy evaluation, to establish performance and identify any shortcomings, will be conducted within 12 months.*

Specific Actions Plan 2008-2012

A number of specific actions are planned:

- A template letter of appointment will be developed, including above policy requirements.
- UCD's 'Guidelines for Designers and Specifiers' will be reviewed and updated. It will include a dedicated section on Energy, energy targets, BMS metering requirements and guidance on the completion of a design study report. The design study report will be consistent with Dún Laoghaire Rathdown Council's policy requirements, allowing it to become part of the planning application process. The Energy section of the Guidelines may also be circulated as a separate document.
- The Energy Unit will actively track new projects during the design process, maintaining an involvement through the client-design team meetings.
- The Energy Unit will monitor results of the pressure-testing and approve energy efficiency aspects as part of building handover.
- The Energy Unit will commission a post-occupancy evaluation during the first 12 months of operation.

4.3 Existing Building Stock

UCD has a large existing stock of buildings. The upgrade of existing mechanical and electrical equipment, and the modification of control systems provides considerable potential to improve energy performance. Some modifications may be justified in terms of energy-savings alone; others may coincide with the normal renewal or repair of existing plant. The key is to select energy efficient options as part of plant renewal activities.
UCD, through its participation in the **e³** energy management bureau, achieved an 11% reduction in energy use in 7 buildings in 2006 (relative to 2003). **e³** is now being rolled out to a further 60000m² of buildings for the period 2007-2010. This means 60% of Belfield's total floor area will be participating in a concerted energy management programme. A separate initiative is underway in the Conway Institute, and this has succeeded in offsetting increases in energy use associated with research activities.

The trend toward mechanical cooling for comfort poses a growing challenge. **e³** recently produced an information booklet on energy efficient mechanical cooling, and this is available from the Energy Unit and through the **e³** website: www.e3.ie

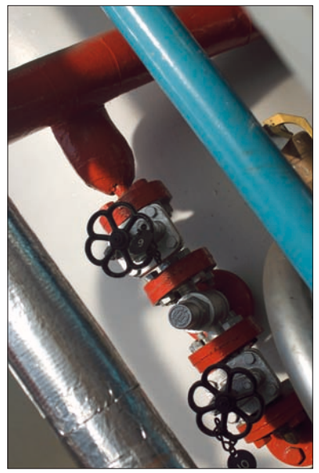
The retrofit of computer server rooms into existing buildings, or upgrade of existing rooms, has caused significant increases in energy use.

Energy management in existing buildings requires detailed energy monitoring information, and this is available via UCD's own monitoring system, which covers all Belfield buildings.

Policy

In the case of existing building stock, UCD's energy policy is to:

- *Identify and implement cost-effective measures that will reduce demand for energy.*
- *In the case of maintenance/plant renewal, to consider the operational (energy) costs as well as capital costs when procuring equipment.*
- *Only install mechanical cooling for comfort where (a) local temperature sensors demonstrate zone temperatures regularly exceed 24degC (b) alternative cooling options have been considered and are not suitable.*
- *Only energy efficient split air conditioning units (A-rated) with variable speed drive will be selected. BMS interface is essential.*
- *Portable electric heaters are banned and will be removed when found.*



Specific Actions

A number of specific actions are planned:

- Sustain the 11% energy saving achieved in **e³** phase 1 buildings, and achieve 10% savings in **e³** phase 2 buildings.
- Extend **e³**, or a similar initiative, to cover 90% of Belfield floor area by 2010, with a view to achieving 10% savings in these buildings by 2012.
- Draw up a schedule of existing Split system A/C units, estimate operating costs, and advise users on the efficient operation of these units.

4.4 Occupant Behaviour

Introduction

Once a building has been constructed many aspects of its energy consumption are fixed. However, occupant behaviour is a variable that has significant impact; energy savings of 10% through good housekeeping measures are often cited. In UCD's case building occupants may be broken into 4 categories: students, academic staff, services contractors (e.g. cleaners), and Building and Services staff/facilities managers. The majority of occupants will only modify their internal environment where their comfort is affected (e.g. opening a window or turning on a light), reflecting the fact that most occupants have no accountability for energy costs and have low levels of awareness of the environmental impact of their actions.

In order to modify occupant behaviour it is recognised that they must be provided with the awareness, the motivation and the means to reduce energy consumption. However, as many of the occupants are transient and have limited impact on energy use, appropriate communications mechanisms must be selected.

The recent adoption of an Activity Based Costing model, with Schools responsible for their actual (i.e. metered) energy costs has increased awareness and is likely to have the single biggest impact on occupant behaviour. In common areas, which are managed by Services, it may be possible to adopt a similar, budgetary-based approach.

Policy

In the case of occupant behaviour, it is UCD's energy policy to: raise the awareness of all occupants; provide motivation to occupants through accountability and incentive measures; and to ensure that where it is considered most effective for occupants to have control of their environment, they are informed as to how they can use these controls to save energy.

Specific Actions

A number of specific actions are planned:

- Roll out energy rating posters based on the **e³** design and, subsequently, Energy Performance in Buildings Directive format.
- Implement virtual, followed by actual, billing of Schools for actual energy use.
- Trial a budgetary-based approach of charging Services for energy costs in a common area.
- Arrange for 2 feature articles per annum in college media.
- Distribute reminder stickers and posters.

5 Implementation

The practical implementation of this energy policy requires putting in place:

- an organisation structure to oversee progress and practically implement it.
- a detailed implementation plan.
- a budget.
- annual review.

5.1 Organisation Structure

Accountability is essential to the success of this programme: the organisation structure needs to support this. The Buildings Officer has given his commitment and support to the programme, and provided an overall budget.

Key Players

Energy Conversion–this is managed by in-house personnel within the Buildings Office, with the Energy Unit and Physical Plant sub-groups having control over virtually all aspects of energy conversion.

New and Refurbishment Building Design–The project co-ordinator within the Buildings Office to have responsibility for issuing a letter of appointment, briefing design teams on the department's energy policy and the requirement to have design studies carried out before submission of planning applications

Existing Buildings–Minor works projects are undertaken by practically all staff within Buildings and Services and many of these projects involve decisions which impact directly or indirectly on energy efficiency. The Energy Unit will be responsible for identifying energy related issues and liaising with the relevant project manager.

Building Occupants–To date awareness and training have been included in the **e³** programme.. There is opportunity to employ a range of college communication media to support this effort and the part-time involvement of a communications/marketing professional is being considered. There may also be scope for the direct involvement of the Services sub-group in managing energy use and costs in common spaces within buildings.

5.2 Roll Out

Policy Communication

As this is a Buildings Office document, the policy requirements and specific actions will be communicated by the Director of Buildings to his staff via presentation.

Steering Group

In order to maintain focus, a steering group consisting of the Director of Buildings and the key players identified above, will meet to review progress and discuss future actions on a quarterly basis.

The Steering Committee's activities include:

- Review progress on the specific actions identified in this document.
- Agree and push action to achieve goals.
- Provide budget approval for specific measures.
- Politically and practically support implementation.
- Provide recognition for success.

It is recognised that the input or contribution of others will be necessary from time to time. For instance, if it is necessary to bring academic staff or students on board for specific building measures, then a faculty member or students union representative will be asked to contribute on a temporary basis to the functioning of the Steering Group. In addition, the facilities managers for particular buildings will be asked to contribute, as appropriate. Computing Services also have a role to play.

The Role of the Energy Unit

The role of the Energy Unit will be set out in a detailed business plan aimed at ensuring delivery of the overall policy objectives set out in this document

5.3 Budget

To date a large proportion of the Energy Unit costs have been met through SEI funding for the **e**^{3} Bureau and the Model Solutions programme. This funding will be phased out over the next three years so there is a need to make budget provision under two headings:

(1) to run the programme– includes **e**^{3}, consultant time, contractors, etc.

(2) to invest in energy efficiency projects.

It is proposed that the budget for item (1) above be set at 5% of the annual energy spend (€5.5 milliom in the 2007 financial year).

Energy projects will be part funded from a small premium in the electricity charge to schools, with matching funding from the Buildings Office general project allocation.

5.4 Programme Review

Progress of this programme against annual targets and toward the overall energy-saving goal will be referred to at all Steering Group meetings. An annual review will:

- Evaluate progress against targets.
- Review the implementation plan in terms of past progress and future requirements.
- Agree the allocation of resources, including budget.
- Review this energy policy.