Energy Efficient Electric and Electronic Office Equipment: 5E in Universities

Project Report on Pilot Action

Heriot-Watt University

DRAFT

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5E in Universities: a project report from Heriot-Watt University, UK

This document describes Heriot-Watt University (HWU) pilot action. It summarises the progress of the implementation of the SAVEII 5E procurement Guideline (SISTech, 2004) and examines the feasibility of adopting the Guideline for subsequent tendering processes.

1. Introduction

Heriot-Watt University (HWU) has a central procurement function (Purchasing & Supply Department) with devolved order processing. HWU operates within local geographical, regional and national consortia and specialist collaborative joint ventures. These include **Proc-HE** and **Proc-NIC**. Proc-HE is the body responsible for developing and implementing the procurement strategy for UK Higher Education. Proc-NIC is the consortia for Scotland and Northern Ireland.

Contractual agreements and standing offers for most commodities are therefore in place as a result of the ongoing work of these various bodies. Because of these active contractual agreements and framework, HWU is to a certain degree constrained in its ability to change its current tendering process.

As a result of the above-mentioned agreements, Purchasing and Supply Department is restricting the purchase of larger items such as PCs to one or two pre-qualified sources. Office equipment purchases are co-ordinated by Purchasing & Supply Department based on tailored institutional implementations of the Inter-regional Desktop PC Agreement, the National Notebook Computer Agreement, Server Agreement, National Printer Agreement and National Copier Agreement, etc.

The goal of the Pilot Action was therefore set to introduce "green criteria" based on the 3-level concept into procurement process within the current frameworks set by above-mentioned contractual agreements.

Prior to the Pilot Action, the following **points of reference** had been identified:

(1) As a general point, HWU is striving to incorporate the concept of sustainable development into every aspect of its activities including curriculum design, sustainable engineering, sustainable procurement and sustainable estate management. 5E forms part of this on-going process at HWU.

(2) It was recognised that financial management within the University would play an important role in adopting and implementing a sustainable strategy. The University established a Cost Saving Group chaired by the Deputy Principal, which commission a working group on 5E in Universities. The working group was commissioned to find evidence in terms of reduction in Whole Life Cost (WLC) for supporting the initiative of green procurement of PCs.

(3) Heriot-Watt University is a member of regional and national consortia, namely Proc-HE and Proc-NIC. As reported in the Third Project meeting (in

Triest University, Italy), the agreement is of 3-year term and the expiring data for the current agreement is 31st July 2005. This mean within the 5E Project life span the Pilot Action can only be of small scale.

(4) Currently there are two agreed PC manufactures for HWU. The University is currently in a 3-year leasing contract with one of them till July 2005.

(5) Through the 5E project, HWU will not only try to incorporate green criteria into procurement process, but also improve the current computing management system to add further value to the project.

(6) Addition to the implementation of the Guidance, HWU is to carry out original research on energy savings due to remotely controlled power system, and savings due to LCDs as a substitute for CRTs.

(7) It was recognised that reducing the cooling demand could be a direct result of reduction in power consumption. Research work has been commissioned to investigate the potential savings due to reduction in cooling demand.

To summarize, this report provides an overview of the key issues with respect to the implementation of the Pilot Action in HWU. These issues include:

- The project team structure and related management issue
- The adoption of the Guideline (SISTech, 2004) and the concept of WLC
- The pilot action: energy efficiency data from PC suppliers
- Introducing remote controlled power on-and-off technique
- Research on the potential cost savings due to the introduction of LCDs
- Evaluation of the feasibility and potential impact of adopting the Guideline (SISTech, 2004)

2. The project team structure and related management issue

Financial management within the University plays an important role in adopting and implementing a sustainable strategy. Finance Directors and other financial managers have a significant role to play in enabling and encouraging green procurement or sustainable purchasing. They can:

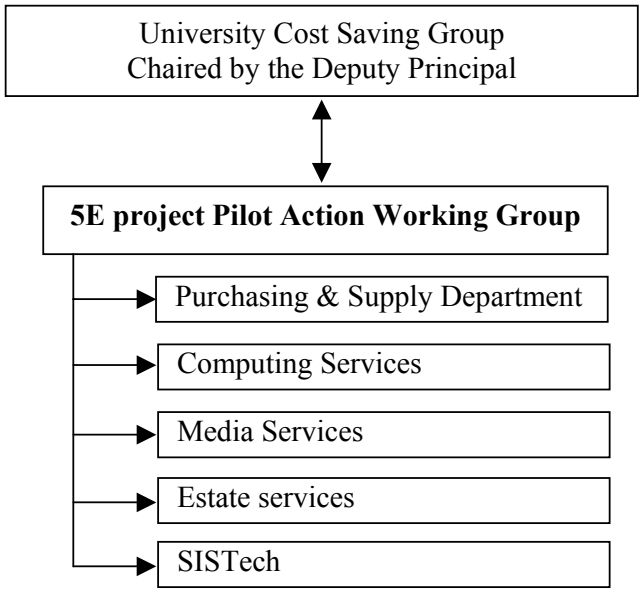
(1) Address the issue of "hidden" overheads by introducing financial information systems that reveal all of the costs associated with the acquisition of a product or service
(2) Encourage the application of Whole Life Costing Principles (HEPS, 2001)
(3) Allocate budgets so as to encourage budget-holders to invest to save. This may mean, for example, allowing extended payback periods for equipment purchased.

    In the context of this Pilot Action, this means PCs or monitors that are more efficient in energy consumption could be considered even if they are of higher purchasing prices compared to other PCs or monitors.

    Particularly, in the case of LCD screens, the case is more prominent. Currently LCD screens are more expensive than conventional CRT screens. However, the management team in HWU decided that if there were evidence showing that LCD screens are of lower WLC, they would be purchased to replace CRT monitors.

(4) Allow savings achieved by budget-holders to be used to 'pump-prime' other environmental initiatives (HEPS, 2001).

Having recognised the importance of engaging financial management people for the implementation of sustainable procurement, the following structure was established:



3. The adoption of the Guideline and the concept of WLC

3.1 The adoption of the Guideline (SISTech, 2004)

The Guideline was composed based on the discussion took place in the Third Project Meeting (Triest, Italy) and guidance from the project manager (Winkelmann, 2005) and EVA (2005). Before releasing the Guideline to HWU, it was sent to all project partners for consultation. Positive and helpful feedback was received from EVA, Trinity College Dublin and the University of Coimbra.

The Guideline put forward the 3-level concept given in EVA (2005), which was further explained by Winkelmann (2005). The 3-level concept was given as:

Level-1: General consideration of energy efficiency on the basis of international labels

- Inclusion of a general statement in the tender documents
- Requirement of compliance with the criteria of existing international labels like Energy Star or Energy (GEEA)

Level-2: Requirement of the specification of on-mode and sleep-mode consumption

- For PCs the energy consumption in on-idle und standby-(S3)-mode has to be specified. For monitors the sleep-mode and on-mode has to be specified according to Energy Star-definitions. Values are collected for information but are not rated. Furthermore the requirements under level-1 are applied.

Level-3: Rating of energy consumption in on-mode and sleep-mode. Optional pre-activation of defined settings for power-management.

- *PCs:* Idle mode – consumption according to the definition of EVA. Standby – consumption according to S3-mode specified in ACPI. The rating is done on the basis of annual energy costs as described below.
- *Monitors:* On-mode and sleep-mode consumption is assessed according to *Energy Star*. The rating is done on the basis of annual energy costs. Furthermore the requirements under level-1 are applied.
- Optional criterion: Pre-activation of defined settings for power-management.

Heriot-Watt University agreed to adopt Level-1 and Level-2 criteria in the Pilot Action. Due to the constrain imposed by the timeframe of the project and the contractual agreements that HWU is currently in, it could not adopt leve-3 before July 2005 when the current PC agreement is to expire.

Moreover, the University felt that the adoption of the level-1 and level-2 concept is to serve the end of introducing WLC into procurement process. Further work is therefore required to link the 3-level concept with the WLC criteria.

3.2 The adoption of the concept of WLC

As explained in Section 3.1, HWU sees the importance of adopting WLC as a key criterion for sustainable procurement.

In the Guideline, the following formula was recommended to the University to take WLC of PCs into account in purchasing processes. The formula is:

$$WLC = Cost_{on/idle\ mode} + Cost_{standby\ mode} + Cost_{sleep/off\ mode} + Other\ costs$$

Where:
$Cost_{on/idle\ mode}$ = life-time cost due to energy consumption in on/idle mode;
$Cost_{standby\ mode}$ = life-time cost due to energy consumption in standby mode;
$Cost_{sleep/off\ mode}$ = life-time cost due to energy consumption in sleep/off mode;
Other costs include cost due to air conditioning and waste disposal etc.

In HWU, energy consumption in various modes of operation, plus the availability of power-saving features, has always been a part of the data set requested in tendering exercises to enable a more accurate estimation of the whole life cost for PCs and monitors.

With the WEEE Directive coming into effect, disposal cost will become an important component in WLC. HWU sees the importance of using a holistic approach for achieving sustainable procurement of PCs and Monitors. Energy efficiency is an important aspect to consider in sustainable purchasing. However, it should not be isolated from other aspects of the issue of sustainable purchasing. The adoption of the Level-1 and –2 concepts and the WLC criteria enabled the HWU to make balanced and informed decisions based on not only acquisition cost and features, but also their impact to the environment and the society.

4. The pilot action: energy efficiency data

According to contractual agreement on PC procurement, Heriot-Watt University has two major suppliers, supplier A and supplier B. Although HWU cannot start formal tendering process before July 2005, a mini-tender between the two suppliers is possible.

The details for the mini-tender is:

Tender	HWU-Pilot/PCs
Time Frame	2005/2006. Duration 3 years.
Number PCs	Up to 20.
Purpose / Use	Student computer labs
Value	Unit cost between £600 and £1000.
Incorporation of EE criteria	Level 1 and Level 2

For PCs the following information was required:

- Dimensions / weight / warranty
- Processor, Operating System and Memory
- Internal drives
- Network interface
- **Power consumption in on, off and sleep modes**

The criteria included specifying the power consumption of on and sleep mode, the power management functionality and the ability for the network components.

The evaluation method took into account the WLC and the performance of PCs and monitors. It was felt by the Purchasing and Supply Services that the reality of selection on energy efficiency alone is not possible. Ultimately it is the machine's specification in terms of performance, durability, maintainability, standard builds layout and service support that decides. Selection must be based on the right machine for the application.

PCs from both suppliers meet Energy Star standard. Using the power consumption data given in above, it is possible to estimate the energy cost due to the PCs from two suppliers.

The estimation was made based on a typical usage of 12 hours on-idle, 8 hours sleep and 4 hour standby (controlled by remotely controlled power down). Figure 1 below details the estimated daily energy consumption for each suppliers offered desktop PC and monitor solution.

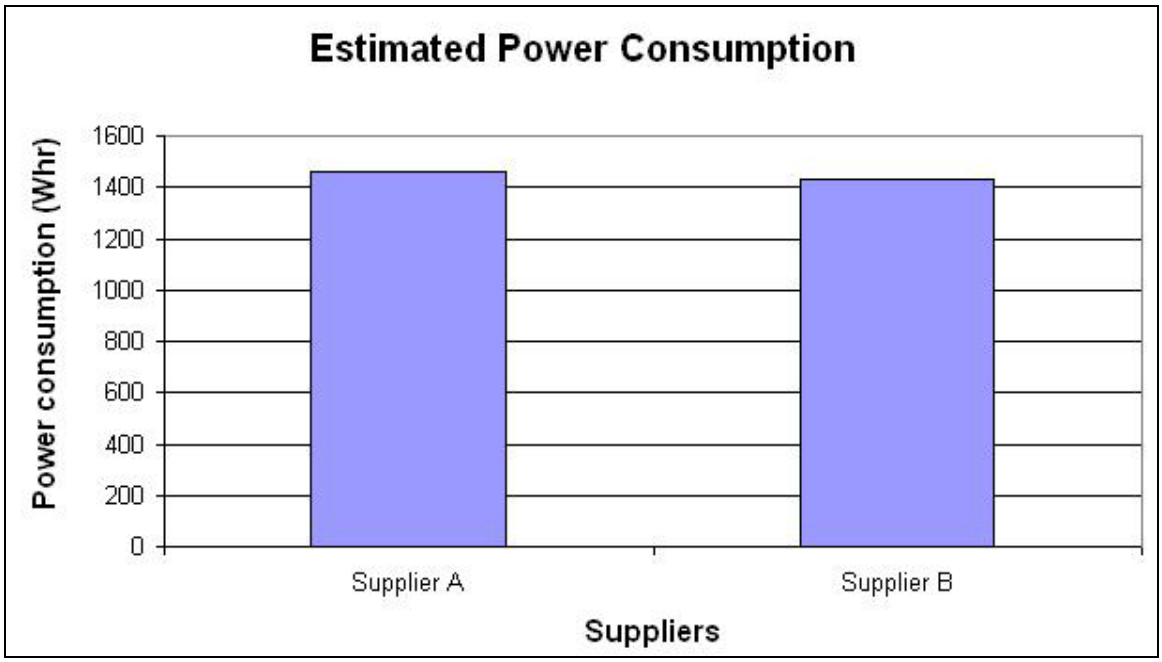


Figure 1 Pilot Action: estimated power consumption

The current default power management policy for PCs in student labs is 24hr on. This is for to allow remote software update during the nighttimes. Currently the University is implementing a new system that could significantly reduce energy consumption of the PCs and also solve the common problem of over-heating in the lab rooms. This involves using software package that will enable PCs to be remotely switched on and off.

5. Introducing remotely controlled power management scheme

5.1 The scheme

Currently, the default power management policy for PCs in student labs is 24hour on. This is for to allow remote software update during the nighttimes. It was recognised that improving the current power management system would bring significant saving.

However, this involves technique that can enable PCs to be remotely wakened up through network interface. The technique requires all PCs to be equipped with network cards that support this operation. The issue of power surge made it necessary for PCs in the campus to be switched off in different batches.

The remote power down of desktop PCs that are distributed widely around the campus is controlled through software that makes use of features of the PCs themselves and of the network operating system (Novell Netware and ZenWorks).

The purpose is to power down the PCs whenever the buildings in which they are located are closed, so that electricity is not wasted running machines which are not accessible to users, e.g. during evenings and weekends. The software is configured to give users a warning message on each screen at intervals of 5 or 10 minutes leading up to the time when their particular building is due to be closed. The different opening and closing times of each building are readily accommodated, and the warning messages and eventual power down also assist staff in clearing users who may otherwise be reluctant to leave at closing time.

The software control enables PCs to be powered up again remotely under central control at any time during the night when it is required to update them with system or applications software upgrades, security patches, etc. Each PC is left in a state where it can be powered up directly by any user at the touch of its mouse or any key. Electrical power only starts to be consumed again at the first use each day, and exceptions such as occasional weekend opening do not require re-programming of the central software control commands

The new solution is currently being rolled out in all student computer labs.

5.2 The schedule

A typical daily schedule for this new power management scheme is:

8am	All PCs switched off
8am-10pm	PCs remain off until students switch them on
10pm	All PCs are switched off
2-8am	PCs are remotely wakened to run Security Updates, Virus Checker Updates and Software\System Updates.

5.3 Potential cost savings

The table in below forecast the potential in cost savings due to this new scheme.

	Old power management scheme	**New power management scheme**
Hours on	24	20
Annual power consumption (KWH)	480	400
Annual cost on electricity (£)	£54	£45
Annual saving (£)	N/a	£9 per PC

Total saving university wide: about £19,250 per year.

6. Research on the potential cost savings brought by LCDs

Research carried out in University of Technology indicated that the air-conditioning cost due to each PC could be as large as between 0.1-0.2 Euro/Watt/PC per year (Sakulin and Schmautzer, 2005). Therefore, indirect savings as a result of reduction in energy use due to air-conditioning could also be remarkable.

On the same issue of air-conditioning, the 5E project team in Heriot-Watt University is carrying out a different research that focus on the cost savings due to the introduction of LCDs. It is hoped that by replacing CRTs with LCDs in computer labs, substantial cost savings could be achieved as a result of reduction in power consumption.

The research involves an 8-week experiment that would enable the comparison between room temperatures for computer labs with CRTs and LCDs. The experiment schedule is given in below.

Periods	Subject	Purpose / data
Week 1 – Week 2	***Scenario 1:*** PCs with conventional CRT monitors; Power off between 10pm and 8:45am	(1) Power consumption baseline data (2) Temperature baseline dataset 1
Week 3 – Week 4	***Scenario 2:*** PCs with conventional CRT monitors; Power on 24 hours	(1) Energy saving due to remotely controlled power down (2) Temperature baseline dataset 2
Week 5 – Week 6	***Scenario 3:*** PCs with flat LCD screens; Power on 24 hours	(1) Energy saving due to LCDs (2) Temperature dataset 3
Week 7 – Week 8	***Scenario 4:*** PCs with flat LCD screens; Power off between 10pm and 8:45am	(1) Energy saving due to remotely controlled power down (2) Temperature dataset 4

The experiment is to be finished in April 2005. The results will be taken into account in future procurement process.

7. Conclusions

Through the implementation of the Pilot Action, Heriot-Watt University incorporated green criteria into its current and future tendering processes. The University adopted the Guidelines (SISTech, 2004) for green procurement. A pilot mini-tender was carried out successfully and products from two major suppliers were evaluated against energy efficiency data. Moreover, the concept of WLC has been adopted as a principle for sustainable purchasing.

Although confined by various contractual agreements, HWU carried out a mini-tender and two related research projects on energy saving. The potential for cost saving has been estimated to be more than **£19,250 per year.**

On the potential impact of the Pilot Action, because HWU is a member of regional and national consortia **Proc-HE** (Procurement for UK Higher Education) and **Proc-NIC** (Procurement for Scotland and Northern Ireland), it would be able to influence more than 30 universities in the UK through disseminating the results obtained from this project. This could create a great impact in the higher education sector in the UK.

8. Acknowledgements

I would like to thank Colin Harris and Tim Cooper from Trinity College Dublin, Schappi Bernd from EVA and Paula Fonseca from University of Coimbra who have provided useful information, advice and material for us to develop the Guidance.

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