

Project Acronym: SISP
 Version: v1
 Contact: Steve Mosley (s.mosley@uea.ac.uk)
 Date: 17/11/08



Project Document Cover Sheet

Project Information			
Project Acronym	SISP		
Project Title	Sustainable ICT Service Provision		
Start Date	1 st Oct 2008	End Date	31 st March 2010
Lead Institution	University of East Anglia		
Project Director	Jonathan Colam		
Project Manager & contact details	Steve Mosley Tel: 01603 592384 Email: s.mosley@uea.ac.uk		
Partner Institutions	None		
Project Web URL	Not in place yet		
Programme Name (and number)	JISC CIRCULAR 7/08 – INSTITUTIONAL INNOVATIONS		
Programme Manager	Andy Dyson		

Document Name			
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Document History		
Version	Date	Comments
V1	17/11/08	Final project plan as submitted to JISC



JISC Project Plan

Overview of Project

1. Background

The University has a strong track record in research into sustainability issues as witnessed by our five star School of Environmental Science, Climatic Research Unit, School of Development Studies, inter disciplinary work on sustainability, CRed and Carbon Connection groups and the first Low Carbon MBA in UK HE. An excellent record on carbon reduction has also been demonstrated by the construction and management of award-winning innovative and energy efficient buildings and there is already a significant measure of low carbon power generation and heating/cooling in place on campus with plans underway to enhance this by introduction of a biomass fuelled heat/power generation plant and further utilisation of the campus wide energy efficient cooling and heating infrastructure. The recently revised Corporate Plan has also set the goal of UEA being an exemplar of good environmental practice by becoming a Low Carbon Campus and next year will see emissions per student reduced by 65% (from a 1990 baseline), once the biomass fuelled heating/ power generation plant is operational.

The Information Service Directorate (ISD) has recently embarked on an intensive programme of improving ICT services which has included significantly enhancing and expanding central data storage, increases in our high performance compute power and a significant increase in the number of servers used to support corporate and teaching applications including a Managed Learning Environment. In order to support the additional infrastructure and improve resilience and maintain business continuity, a second Computer Suite in addition to the original has now been built. Contrasts between the energy efficiency of the two Computer Suites, in particular their cooling, and concerns about rising energy consumption caused by increases in server numbers have resulted in senior management realising that improvements in energy consumption and sustainability are also required if ICT service development is to continue as planned.

2. Aims and Objectives

The project aims to determine the sustainability of current University ICT services in terms of their energy consumption and CO₂ emissions and to investigate and implement strategies by which the sustainability can be significantly improved in a cost effective manner without unduly compromising services and allowing planned ICT service enhancement programmes to continue. This will require a review of IT requirements for service and matching of these against the most appropriate technology as well as review and development of procurement, deployment and disposal policies for ICT. The project will focus on two main areas; the University's data centre/ server hosting facilities and end-user desktop systems.

The project will serve as a practical exemplar of how similar HE institutions can approach ICT sustainability issues and will produce guidelines that can be modified and incorporated into other institutions ICT sustainability planning. By demonstrating the level of improvement in sustainability achievable by each initiative, the project will have a very real impact on decision making about ICT procurement and replacement strategies.

The objectives of the project are to:

- Determine the impact on energy consumption and sustainability of the University's data centre operations and by comparing energy efficiencies of the old and new Computer Suites and conducting external research, determine and implement a strategy for sustainable expansion of University data centre operations and provide a model for other HE data centres.
- Develop and implement plans to improve energy efficiency of servers by using service virtualisation and 'self-regulating' blade/rack power management systems, measuring the effectiveness of this by monitoring power consumption 'before' and 'after'.
- Evaluate energy consumption and CO₂ emissions of current desktop systems in student IT areas, admin offices and academic/research offices and conduct pilots using alternative low energy consumption devices to explore the potential of these for improving sustainability.
- Conduct a feasibility study into use of DC power direct from photo-voltaic panels to end-user devices as a means of increasing energy utilisation from current UEA photovoltaic panels and exploring the potential for such in future building projects.
- Develop a business case for a hosted data centre service for regional HE/FEs taking advantage of UEA's location and ability to generate Green power.
- Review and revise UEA's ICT procurement and deployment policies based on research, testing and evaluation from the project; this will include revision of our managed PC procurement programme through which the majority of PCs at UEA are bought.

3. Overall Approach

The project will focus on two main areas:

- Data centre/servers – will determine energy consumption and sustainability of current data centre operations and develop and implement strategies and policies for improving sustainability by appropriate use of service virtualisation, 'self-regulating' blade/rack power management systems, carbon lean cooling and heat recovery infrastructure and power feed harmonic filters. The impact on sustainability will be determined by using 'before' and 'after' measurements. A business case will also be developed for a hosted data centre service for regional HE/FEs.
- End-user desktop computers in staff offices and IT areas – will measure power consumption of existing provision and evaluate use of alternative low energy consumption desktop computers. Will develop policies and procedures for implementing an automated power management service (auto switch on/off of devices) and will review UEA procurement and disposal strategies for desktop equipment. In addition will conduct a feasibility study into direct utilisation of DC voltage from existing photo-voltaic panel provision and the potential for incorporating into future building projects.

Work in each of the above areas will be comprised of the following four phases:

1. **Research and discovery** - This will involve research into related activities elsewhere (including linked JISC projects at the universities of Hertfordshire and Bolton), attendance at appropriate conferences and learning from other exemplars of best practice. In addition will include the set up of small-scale pilots where applicable, installation of energy monitoring equipment for capturing 'before' and 'after' data, analysis and data mining of data gathered to identify patterns and trends and identification/confirmation of technologies and strategies that are likely to deliver greatest sustainability benefits. Feedback from stakeholders and users will be collected from this phase.
2. **Policy and guidelines development** - ICT procurement, deployment, disposal and usage policies will be reviewed and revised to support more sustainable measures confirmed during the Research and discovery phase. This will involve communication with

stakeholders, user groups and senior management involved in strategy and policy decisions. Technical and best-practice guidelines will be produced to support system administrators, operational staff and those involved in procurement and deployment of server and desktop equipment. End-user education materials will be developed where required.

3. **Implementation and evaluation** - Larger scale campus wide implementation of models and policy determined in the previous phases will take place, which will include service development, embedding of procedures/processes and user education. The effectiveness of measures and policies will be evaluated and their effects on sustainable ICT use including energy consumption and CO₂ emissions. This will involve feedback from stakeholders and users to gauge perceptions and impact on work activities
4. **Deliverables for JISC and HE** - Reports, guidelines and a best practice video will be produced and disseminated via the project website. A conference/workshop, with input from other JISC related projects, will be hosted at UEA to highlight measures that can be used to improve both data centre and end-user computing sustainability.

4. Project Outputs

4.1 For the institution

- A more energy efficient and sustainable data centre and server hosting facility for UEA.
- Strategic and technical guidelines for further improving sustainability of current data centre provision and allowing for future expansion.
- Strategic and technical guidelines for improving sustainability of end-user computing provision.
- Revised ICT procurement and deployment policies covering the entire ICT lifecycle to better support sustainability.
- Feasibility study on direct utilisation of photo-voltaic power for end-user computing.
- Business case for a hosted data centre service at UEA.

4.2 For JISC and the HE community

- Full report detailing measures implemented methodology, costs/benefits and effectiveness of the project in improving the sustainability of the University's ICT services.
- Guidelines and toolkits to aid other HE institutions in improving energy efficiency of their data centre/server hosting facilities.
- Guidelines and toolkit to aid institutions in achieving more sustainable end-user computer procurement and deployment, including guidance in policy development.
- Project website for dissemination of the above.
- Best practice video for sustainable ICT services
- UEA hosted conference on implementing sustainable ICT services

5. Project Outcomes

5.1 Overall Value to the Institution

The project will achieve significant reductions in energy consumption and improve energy utilisation of the University's data centre and servers, as well as producing policy and guidelines which can be

used when implementing new ICT services or enhancing existing ones. This will help in countering the restraining effect of energy costs on further enhancement to ICT provision.

The project will identify appropriate pathways for procurement and deployment of end-user computers and embed the necessary policies and procedures which will allow such provision to grow in a sustainable fashion as the University grows and its reliance on ICT increases.

The project will also assist the University in achieving its corporate goal of "Bridging the global and the local, we have also set ourselves the goal of being an exemplar of good practice environmentally by becoming a 'Low Carbon Campus'." In addition the project will assist in complying with regulations and directives related to energy, CO₂ emissions and sustainability.

5.2 Contribution to JISC Programme and HE

In all HE institutions ICT use is responsible for a significant proportion of their energy consumption and CO₂ emissions, and by improving sustainability and energy efficiency of ICT services the overall environmental impact of the institution can be significantly lowered.

This project with its mix of data centre and end-user focussed initiatives working in conjunction with innovative Estates projects to improve sustainability, such as the biomass fuelled heat/power generator, has the potential to provide models for other HEs and contribute to JISC's aim to deliver innovative and sustainable ICT infrastructure, services and practice.

6. Stakeholder Analysis

Below is a summary table showing the major stakeholders with their estimated interest/stake and importance to the project.

Stakeholder	Interest / stake (1-5)	Importance (1-5)
UEA Sustainability Group (overseeing increase in sustainability at UEA)	5	5
UEA Executive Team (Corporate Plan)	5	5
ISD (data centre/server hosting, responsible for provision of core services and largest provider of student IT areas)	5	4
Estates (responsible for power, heating and cooling infrastructure)	5	4
Faculty Managers (responsible for desktop procurement within their Schools)	3	4
Users of desktop machines (require fit for purpose computers)	3	4
UEA Research community (require infrastructure capable of meeting increasing data storage needs and high performance computing)	3	3
Dell (Supplier for UEA Managed PC Procurement Service)	3	3
JISC (representing HEFCE strategic goals)	4	4
Other HEIs (facing similar issues to UEA)	3	4
UK Government (to meet national carbon emission targets)	2	2

7. Risk Analysis

Risk	Probability (1-5)	Severity (1-5)	Score (P x S)	Action to prevent/manage risk
Staffing				
Delay in appointing new project staff (Research Assistant and	5	3	15	Re-scheduling of some work, Project Manager

Development Technician)				undertakes some of Research Assistant work in early stages
Staff working on project unable to cope with competing workloads of other projects, causing delays	3	3	9	Project to maintain good communication with project workers and their parent division/unit, ensuring their project time commitments are adequately allowed for alongside division/unit commitments. Re-schedule project tasks where possible to resolve conflicts.
Organisational				
Delay in Estates implementation of sustainable power, heating and cooling infrastructure potentially removing the opportunity to compare the impact of this initiative on sustainability.	2	4	8	Maintain good communication channels with Estates so receive early warning of any delays. Some evaluation based on paper specs is possible and possibility of re-scheduling some Estates work within the the project.
Technical				
Network security prevents power management system from passing instructions to desktop systems	2	5	10	Thorough investigation and testing of this aspect before selecting appropriate system
Unforeseen breakthroughs in reducing energy consumption of desktop computers makes some of evaluation work in end-user strand redundant	2	3	6	Relevant project team workers need to regularly update their view of this market.
External suppliers				
University suppliers unwilling to engage with project	2	4	8	Early discussion of project with suppliers and communication of its importance to the University
Legal				
Suppliers' warranty and health and safety restrictions prevent sourcing of desktop equipment for photovoltaic panel DC to DC testing	4	2	8	Ensure early identification of equipment required and contact with relevant supplier
Suppliers' legal restrictions prevent sharing of some information with University	2	3	6	Ensure early identification of any critical supplier information and check availability of information in advance of work

Other				
Over surfeit of conferences/workshops with a 'green' theme causes lack of interest in UEA conference	3	2	6	Check with JISC and others on planned conferences for 2009 and re-schedule if possible. Ensure good promotion of event.

8. Standards

Name of standard or specification	Version	Notes
Wake-On-Lan		Wake-On-Lan technology is the standard most likely to be used to enable the selected power management system to remotely wake up or switch off PCs
Intel VPro		VPro technology will be considered as an alternative to Wake-On-Lan, but early investigation suggests that the additional cost of VPro enabled desktops will prevent use of this during the project lifecycle
DOC	Word 2003	Word DOC format 2003 will be used for working documents related to the project
PDF		Adobe Portable Document Format will be used for final published reports and guidelines which are not intended for alteration/re-working

Specific standards related to video production and distribution will not be determined until the video content and methods of distribution have been agreed, but will conform to DVD-Video standards for the UK and/or accepted best practice for video streaming in UK HE.

9. Technical Development

No software development is planned as part of this project. Systems development and integration work carried out during the project will be managed according to University project management methodology (see section 12. Project Management).

10. Intellectual Property Rights

All project outputs will be made available, free at the point of use, to the UK HE and FE communities in perpetuity, and they will be disseminated widely by the project in partnership with JISC. Should any software components be developed by the University during the course of the project, they will be released under appropriate open source licensing to ensure that they can be freely shared with organisations and communities with which JISC has close working arrangements.

If any collaborative work is done with the University's suppliers during the course of the project, then the results of that collaborative work will also be made available free of charge to the UK HE and FE communities providing no commercial contracts with the suppliers are compromised. If collaborative work with University suppliers results in production of bespoke software components for software owned by the supplier, availability of that to the wider HE and FE community will be managed, protected and commercialised by the University's Technology Transfer Office in consultation with the supplier and JISC.

UEA has existing (background) IP relating to the assessment and monitoring of the carbon footprint of products and processes. In addition it has expertise in carbon reduction programmes that has been

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successfully commercialised. UEA operates a wholly-owned subsidiary company, Low Carbon Innovation Centre Limited (LCIC), for the purpose of commercial exploitation of its carbon expertise. Where licences to UEA background knowledge or IP are required by any of the HEIs in order to make use of the Project, these will be made available on a non-exclusive basis (without rights to sub-licence). UEA, via LCIC Ltd. will negotiate these on a case-by-case basis. It is not envisaged that this caveat will present any obstacles to the uptake of the Project outcomes by any HEI.

Project Resources

11. Project Partners

None, all members of the project team are members of the University.

12. Project Management

UEA has an agreed project management methodology, based on Prince2 which will be used for the project.

The Project Board will be the University's Sustainability Group which reports to the Executive Team and is chaired by the PVC for Research and Knowledge Transfer, Prof. Trevor Davies who is a previous Head of the School of Environmental Sciences and is Director of CRed. Members of the Sustainability Working Group include representatives from Information Services Directorate, Estates, Residential Services Division, Finance Division, School of Environmental Sciences and Union of UEA Students. The Project Board will co-opt other individuals from within the University to act in an advisory capacity as required/appropriate.

Jonathan Colam, Director of Information Services, will be the Project Director for this project, providing a reporting and link point for the Project Manager to ensure that project work is coordinated with the ISD programme of work and activities of the Sustainability Group of which he is a member. Jonathan will also act as point of contact for liaison with the University's Information Strategy and Services Committee (ISSC) which reports to the University Executive Team.

Project Team members are:

- Steve Mosley from the Information Services Directorate (ISD) is the Project Manager (40% FTE) and has overall responsibility for planning, ensuring that project commitments and deadlines are met and that reporting to JISC happens as agreed. Steve is ICT Policy Manager for ISD and will lead on any policy development within the project.
- A Research Assistant based within ISD (100%FTE) will be appointed for the life of the project starting in month three/ four to assist with research and day to day management and coordination of the project activities.
- An IT Development Technician based in ISD (100%FTE) will be appointed to assist with server virtualisation, installation and configuration of energy monitoring systems, configuration of desktop computers and installation of software.
- Iain Reeman ICT Systems Director (2.7% FTE) has responsibility for work to improve the energy efficiency of data centre/server hosting. As UEA ICT Systems Director and member of the ISD Management Team, Iain also has overall responsibility for ICT infrastructure and services including data centre and server hosting facilities, the network and provision of centrally managed student IT areas. He will also enlist the services of other ICT Systems staff; Dominic Belisario (Head of Desktop Services and Computer Suite), Alan Wilson (IT Support Manager HUM and Central Services) and other staff as required.
- Martyn Newton, Risk and Sustainability Manager (4% FTE), from the Estates and Buildings Division will be responsible for managing the Estates contribution to the project and contributing to reports and feasibility studies regarding utilisation of low carbon power

generation, cooling and heat recovery infrastructure. He will also enlist the services of other Estates staff; Paul Totton (Building Management Systems Manager), Neil Wilson (Deputy Operations Manager), Steve Edwards (Electrical Services Design Engineer) and Mel Pascoe (UEA Energy Manager) to advise and lead on Estates tasks included in the project.

- Dr. Keith Tovey(24% FTE), Reader from the School of Environmental Sciences and specialising in energy research, will be responsible for research and feasibility studies into the effectiveness of heat recovery mechanisms from the data centre, CO₂ emissions calculations and feasibility of using direct utilisation of DC output from Photo-voltaic panels
- Dr. Tony Bagnall (5% FTE), Senior Lecturer from the School of Computer Science (CMP) will undertake data mining and statistical analysis on data from energy monitoring devices and advise on sampling strategies.
- Glen Medlar (6% FTE) is Media Producer in the University's Audio Visual Service and will supervise production of the best practice video.

13. Programme Support

The quality plan requires peer review of produced guidelines by ICT service management in other HEs and by linked projects which are currently engaged in similar work (e.g. Universities of Hertfordshire and Bolton), or that have already undertaken work in this area. It would be useful if Programme Support for the Institutional Innovation projects could facilitate this.

14. Budget

The project budget is detailed in Appendix A.

Detailed Project Planning

15. Workpackages

Project work has been organised into five workpackages:

- **Workpackage 1: Monitoring and evaluation** - Current energy consumption and CO₂ emissions attributable to University ICT services will be determined, across both the data centre and end-user desktop computer provision. This will be achieved by a combination of real-time measurement and using estimation tools to extrapolate to the whole campus. Statistical analysis and data mining techniques will be used to identify usage and cyclical patterns, and the effect of implemented measures throughout the project will be evaluated.
- **Workpackage 2: Data centre energy utilisation** – The current energy consumption of the University's data centre operation and hosted services will be determined from outputs of Workpackage 1. Energy saving measures, including service virtualisation and alternative cooling strategies, will be investigated and where appropriate implemented, with the effect of these on energy consumption and CO₂ emissions being evaluated.
- **Workpackage 3: End-user computer sustainability** – The current energy consumption of University provided desktop computers will be determined from outputs of Workpackage 1. Alternative low energy consumption desktop computers will be piloted and an automated power management system will be introduced, with the effects of these on energy consumption being measured and evaluated. Investigation into improved utilisation of currently installed photovoltaic power by use of DC circuits and incorporation into future building projects will also be undertaken.

- **Workpackage 4: Policy review and development** - Reviews of University ICT procurement, deployment and service development policies will be undertaken in order to incorporate more sustainable practices into procurement and delivery of University ICT services.
- **Workpackage 5: Dissemination** – Guidelines, reports and toolkits for wider use in HE/FE will be produced based on outputs of WorkPackages 1 to 4. A free Sustainable ICT Services conference will be hosted at UEA and a best practice video for sustainable ICT services in HE will be produced and distributed.

Details and scheduling of workpackage tasks are provided in Appendix B.

16. Evaluation Plan

Timing	Factor to evaluate	Questions to address	Method(s)	Measure of Success
Jun 2009	Feasibility of direct DC utilisation from PV panels	Are predicted efficiency gains demonstrated in testing?	Testing of DC direct to end user device and measurement of energy efficiency gains.	Significant decrease in power loss demonstrated by use of direct DC.
Jul 2009	Effect of low energy desktop computers	Will deployment of these achieve significant decrease in energy consumption whilst still fit for purpose	By piloting measure and compare energy consumption of 'standard' and 'low energy' devices in different use scenarios. Check on fitness for purpose and user acceptability.	Significant decrease in energy consumption as measured in the pilots and when forecasted for use across the institution. No reduction in quality of service.
Dec 2009	Service virtualisation	Has virtualisation achieved significant reductions in energy consumption without compromising service?	Measure data centre energy consumption before and after each service virtualised. Check that service performance acceptable with stakeholders/users.	Significant decrease in number of operational servers and total energy consumption. Services still fit for purpose.
Jan 2010	Effect of desktop power management	Has implemented power management system caused decrease in energy consumption by desktop computers without any reduced quality of service?	Measure energy consumption before and after. Check on any service issues and user acceptability.	Significant decrease in power consumption of desktop computers. No reduction in quality of service.

Jan 2010	Effect of UEA's enhanced low carbon power, cooling infrastructure on data centre sustainability	Have enhancements realised gains in energy efficiency of data centre and sustainability?	Measure carbon footprint before and after each enhancement.	Significant decrease in CO ₂ emission.
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17. Quality Plan

More energy efficient and sustainable data centre for UEA					
Output Timing	Quality criteria	QA method(s)	Evidence of compliance	Quality responsibilities	Quality tools (if applicable)
Jan 2010	Energy consumption lowered	Before and after measurements	Significant reduction in total power used	Iain Reeman	
Jan 2010	Improvement in Power Usage Efficiency (PUE)	Before and after measurements	Significant decrease in PUE	Iain Reeman	
Jan 2010	Service quality maintained	Monitoring of service performance	No increase in service downtime or response times	Iain Reeman	

More energy efficient and sustainable end-user computer provision for UEA					
Output Timing	Quality criteria	QA method(s)	Evidence of compliance	Quality responsibilities	Quality tools (if applicable)
Jan 2010	Energy consumption lowered	Before and after measurements in pilot areas, extrapolated to whole campus using modelling tools	Significant reduction in total power used	Steve Mosley	
Jan 2010	Computers fit for purpose	Monitoring of applications performance and feedback from users	No significant slowing in applications and positive feedback from users	Steve Mosley	

Guidelines for sustainable data centres					
Output Timing	Quality criteria	QA method(s)	Evidence of compliance	Quality responsibilities	Quality tools (if applicable)
Feb 2010	Relevant to need	Peer review by other HE ICT service providers and linked JISC projects (Universities of Hertfordshire and Bolton)	Addresses concerns of other HE data centre managers	Iain Reeman	

Feb 2010	Wide applicability	Peer review as above	Guidance can be applied across a wide variety of HE data centres	Iain Reeman	
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Guidelines for sustainable desktop computing provision					
Output Timing	Quality criteria	QA method(s)	Evidence of compliance	Quality responsibilities	Quality tools (if applicable)
Feb 2010	Relevant to need	Peer review by other HE ICT service providers and linked JISC projects (Universities of Hertfordshire and Bolton)	Addresses concerns of other HE IT managers	Steve Mosley	
Feb 2010	Wide applicability	Peer review as above	Guidance can be applied across a wide variety of HE data centres	Steve Mosley	

Business case for UEA hosted regional Data Centre					
Output Timing	Quality criteria	QA method(s)	Evidence of compliance	Quality responsibilities	Quality tools (if applicable)
Jan 2010	Relevant to need	Peer review	Addresses requirements as identified by JISC and other groups looking at this area	Steve Mosley	

Video – Sustainable ICT Service Provision					
Output Timing	Quality criteria	QA method(s)	Evidence of compliance	Quality responsibilities	Quality tools (if applicable)
Mar 2010	Relevant to need	Peer review of content prior to creation by other HE ICT service providers and linked JISC projects (Universities of Hertfordshire and Bolton)	Addresses concerns of HE ICT service providers	Steve Mosley	
Mar 2010	Pragmatic and focussed	Peer review as above	Offers practical advice based on evidence and case studies	Steve Mosley	

18. Dissemination Plan

Timing	Dissemination Activity	Audience	Purpose	Key Message
Oct 2009	Free conference on Sustainable ICT Service Provision hosted at UEA	HE ICT service and estates management and others responsible for providing ICT services within their institutions	Highlight best practice to reduce the energy and environmental footprint of ICT services whilst maintaining service quality	More sustainable ICT services can be provided in an affordable manner and without compromising service quality
Feb 2010	Guidelines for HE	ICT service and estates management and technical officers	Advise management and technical staff on the practical steps that can be taken to reduce energy consumption of data centres and desktop computer provision	A number of tried and tested methods can be used to reduce energy consumption

19. Exit and Sustainability Plans

Project Outputs	Action for Take-up & Embedding	Action for Exit
Guidelines for sustainable ICT service provision	Hosted openly on the internet (guaranteed there for 5yrs)	Place documentation on website
Evaluation reports	Hosted openly on the internet (guaranteed there for 5yrs)	Place documentation on website
Case studies	Hosted openly on the internet (guaranteed there for 5yrs)	Place documentation on website
ICT energy measurement and monitoring	Energy monitoring processes embedded into ICT service development and operational roles	Define ownership of process by role
Regional hosted data centre business case	Business case reviewed by JISC and UEA Executive	Documented business case submitted to UEA Executive and JISC

Project Outputs	Why Sustainable	Scenarios for Taking Forward	Issues to Address
Guidelines for sustainable data centre and desktop provision	Could be used by other HE/FE institutions to achieve more sustainable ICT services	Publish via project website	
Business case for hosted data centre	Could inform strategic direction of JISC	Submit paper to JISC	

Appendixes

Appendix A. Project Budget



Project Budget

Directly Incurred Staff	Oct 2008 – Mar 2009	Apr 2009 – Mar 2010	TOTAL £
Researcher (project support) Grade 7 (AC2) @100%			
Project Technician @ Tech grade 6 @100%			
Total Directly Incurred Staff (A)			
Non-Staff	Oct 2008 – Mar 2009	Apr 2009 – Mar 2010	TOTAL £
Travel and expenses			
Hardware*			
Dissemination			
Other - UEA hosted conference, project team conference attendance and recruitment costs			
Total Directly Incurred Non-Staff (B)	£ 73,787	£ 5,173	£ 78,960
Directly Incurred Total (A+B=C) (C)	£10,2531	£73,324	£175,855
Directly Allocated	Oct 2008 – Mar 2009	Apr 2009 – Mar 2010	TOTAL £
Staff			
Estates			
Other (Infrastructure technicians)			
Directly Allocated Total (D)			
Indirect Costs (E)	£24,074	£56,775	£80,849
Total Project Cost (C+D+E)	£156,698	£193,578	£350,275
Amount Requested from JISC	£121,541	£113,021	£234,561
Institutional Contributions	£35,157	£80,557	£115,714
Percentage Contributions over the life of the project	JISC 67%	Partners 33%	Total 100%

Nature of Institutional Contributions

Directly Incurred Staff	Oct 2008 – Mar 2009	Apr 2009 – Mar 2010	
Researcher - Grade 7 @100%	£0	£0	£0
Project Technician -Grade 6 @100%	£0	£0	£0
Directly Incurred Non Staff			
Hardware	£0	£0	£0
Travel	£0	£0	£0
Other costs (dissemination/recruitment)	£0	£0	£0

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Directly Allocated			
Staff	£7,861	£16,186	£24,047
Estates	£2,560	£6,038	£ 8,598
Other (Infrastructure technicians)	£662	£1,560	£ 2,222
Indirect Costs			
Indirect Costs	£24,073	£56,776	£80,849
Total Institutional Contributions	£35,157	£80,557	£115,714

Appendix B. Work Packages



JISC WORK PACKAGE

WORKPACKAGES	Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
		2008				2009										2010				
1: Monitoring and evaluation			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
2: Data centre energy utilisation										x	x	x	x	x	x	x	x			
3: End-user computer sustainability					x	x	x	x	x	x	x	x	x	x	x	x	x			
4: Policy review and development							x	x	x	x	x	x	x	x	x	x	x			
5: Dissemination				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Project start date: 1st October 2008

Project completion date: 31st March 2010

Duration: 18 months

Workpackage and activity	Earliest start date	Latest completion date	Outputs (Deliverables and reports in bold)	Milestone	Responsibility
WORKPACKAGE 1: Monitoring and evaluation <i>Objective: To determine current energy consumption and CO2 emissions, identify usage and cyclical patterns, and monitor and evaluate effect of implemented measures throughout the project.</i>					
1a. Monitoring systems determined and installed					
1. Determine scope, sampling, piloting and metrics	17/11/08	01/12/08	Metrics, sampling and piloting strategy to be used.	Y	SM/ TB
2. Determine monitoring equipment	01/12/08	15/12/08	Statement of Requirements for purchase of monitoring equipment.		SM
3. Select estimation tools to be used	15/12/08	12/01/09	Software tools that will be used to extrapolate from sample/pilot measurements to the whole campus		SM/ TB
4. Procure monitoring equipment	15/12/08	12/01/09	Monitoring equipment purchased		SM
5. Install monitoring devices and test data logging	16/01/09	30/01/09	Monitoring system ready to start energy consumption measurement		DB/ Tech
1b. Current energy consumption					
6. Build database of energy consumption	30/01/09	13/02/09	Snapshot of energy consumption across data centres and desktop systems	Y	TB
7. Data mining/statistical analysis of data	13/02/09	14/05/09	Energy consumption patterns and correlations to usage determined.		TB
8. CO2 emissions calculations	14/05/09	13/06/09	Energy consumption mapped to CO2 emissions		KT

9. Evaluate/report on current situation	13/06/09	20/06/09	Report on current energy consumption and CO ₂ emissions from ICT services, and usage patterns affecting this.	Y	SM/ RA
1c. Post implemented measures					
10. Evaluation of implemented measures throughout project	20/06/09	2/03/10	Reports as indicated in work packages 2 and 3 detailing energy savings and environmental gains resulting from each implemented measure	Y	SM/ RA
11. Final report on savings/ gains from the project	02/03/10	16/03/10	Report summarising effect on energy consumption/ CO ₂ emissions for each implemented measure and highlighting issues and further possibilities	Y	SM/ RA
Workpackage and activity	Earliest start date	Latest completion date	Outputs (Deliverables and reports in bold)	Milestone	Responsibility
WORKPACKAGE 2: Data centre energy utilisation <i>Objective: To implement energy saving measures in the data centre and measure their effect on energy consumption and CO₂ emissions</i>					
2a Service virtualisation					
12. Evaluation of current energy consumption	13/07/09	20/07/09	Report detailing current energy consumption of each computer suite broken down into servers, services and cooling	Y	IR/ RA

13. Service virtualisation plan developed	20/06/09	20/07/09	Plan detailing schedule and priorities for virtualisation, methods to be deployed and known issues to be resolved		IR/ DB
14. Virtualisation plans implemented	20/06/09	17/12/09	Services virtualised according to plan	Y	IR/ DB
15. Evaluate/report on effects	17/12/09	24/12/09	Report detailing overall saving in energy consumption from virtualisation, highlighting issues and further possibilities	Y	IR/ RA
2b. Estates related measures					
16. Evaluate impact of district cooling/heating on computer suites	04/07/09	18/07/09	Report detailing differences between cooling of the two computer suites and effect on their energy utilisation	Y	MN/ IR
17. Biomass Combined Heat and Power (CHP) plant operational	21/06/09	22/06/09		Y	MN
18. Evaluate impact of Biomass CHP	20/09/09	19/12/09	Report on impact of Biomass CHP on energy costs and CO ₂ emissions of data centres	Y	KT
19. Harmonic filters installed on power feeds	20/06/09	20/07/09			MN/ SE
20. Evaluate/report on effects	20/07/09	03/08/09	Report on effect of harmonic filters on energy consumption	Y	MN/ SE
21. Measurement and evaluation of heat recovery from 2 nd computer suite.	20/06/09	04/07/09	Report on heat recovered and how it is used		MN/ KT
22. Feasibility study on utilising heat from 1 st computer suite	04/07/09	03/08/09	Report on amount of heat generated and feasibility of using for other purposes	Y	MN/ KT
23. Summary report on effects/gains from 2a-2b	24/12/09	07/01/10	Summary report of effects of all implemented measures on energy consumption and CO₂ emissions	Y	RA
2c. Business case for UEA hosted Data Centre					
24. Check on JISC/HE thinking	05/10/09	04/11/09	Summary of JISC and other related group views/vision regarding regional data centres		RA

25. Determine requirements	04/11/09	04/12/09	IT and power requirements for a regional hosted data centre		RA
26. Determine issues	04/12/09	03/01/10	Summary of potential issues and barriers		RA
27. Determine costs	04/12/09	03/01/10	Estimated costs of a regional data centre		RA
28. Document business case	03/01/10	17/01/10	Report documenting business case for UEA hosting a regional data centre	Y	SM/ RA
Workpackage and activity	Earliest start date	Latest completion date	Outputs (Deliverables and reports in bold)	Milestone	Responsibility
WORKPACKAGE 3: <i>Objective: Evaluate and implement measures to reduce the energy consumption of desktop systems</i>					
3a. Piloting low energy desktops					
29. Sampling strategy and pilots determined	30/01/09	13/02/09	List of pilot areas and individual devices where energy consumption will be monitored	Y	RA/ TB
30. Evaluation of current energy consumption/ CO2 emissions from desktops	13/02/09	27/02/09	Results from pilot areas and devices and estimates for total desktop population	Y	RA/ TB
31. Consultation with stakeholders/ user groups	13/02/09	15/03/09	User requirements from desktop PCs		RA
32. Selection and procurement of low energy devices	30/01/09	01/03/09	Pilot desktop PCs (thin clients and all-in-one type systems) procured.		RA/ AW
33. Installation of low energy devices	01/03/09	31/03/09	Alternative desktops installed in pilot areas		Tech

34. Piloting and feedback	31/03/09	29/06/09	Energy consumption measurements from pilots, feedback to involved parties		RA
35. Evaluate effect and report	29/06/09	29/07/09	Report summarising effects of piloted devices on energy consumption and feasibility of wider use	Y	RA
3b. Power management					
36. Evaluate available power management systems	30/05/09	29/06/09	Report summarising evaluation of available systems and reasons for chosen system		DB
37. Consultation with stakeholders/user groups	30/05/09	29/06/09	User requirements		RA
38. Implementation plan	29/06/09	06/07/09	Plan detailing power management policies to be applied and areas/users to be applied to		DB
39. Roll-out power mgt. service	06/07/09	05/08/09	Power management service applied to desktops	Y	DB/ Tech
40. Monitor	05/08/09	02/01/10	Power measurements from pilot areas, extrapolated to forecast for total desktop population		RA/ Tech
41. Evaluate and report	02/01/10	09/01/10	Report summarising energy savings from applying power management policies	Y	RA
3c. DC utilisation from PV panels					
42. Evaluation of current PV power inefficiencies	02/02/09	04/03/09	Report on inefficiencies of current photovoltaic panel installation		KT
43. Simulation and measurement using DC direct to device	04/03/09	03/05/09	Measurements using test kit		KT
44. Evaluate results and report on feasibility/benefits	03/05/09	02/06/09	Report summarising test results and feasibility, benefits and challenges of incorporating DC circuits in future building projects	Y	KT

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Workpackage and activity	Earliest start date	Latest completion date	Outputs (Deliverables and reports in bold)	Milestone	Responsibility
WORKPACKAGE 4: Policy Review and Development <i>Objective: Review of ICT procurement, deployment and service development policies in order to incorporate more sustainable practices</i>					
45. Consultation with UEA stakeholders	01/05/09	31/05/09	Stakeholder requirements and views		SM/ RA
46. Review of ICT procurement and deployment policies	31/05/09	30/06/09	Proposed changes to ICT procurement and deployment policies	Y	SM/ RA
47. Review of Managed PC Procurement Service	30/06/09	30/07/09	Proposed changes to Managed PC Procurement Service	Y	SM/ RA
48. Review of ICT service development policies	30/07/09	29/08/09	Proposed changes to ICT service development policies	Y	SM/ RA
49. Discuss proposed changes with stakeholders	29/08/09	28/09/09	Proposed policy changes for approval		SM/ RA
50. Changes approved by Information Strategy and Services Committee	01/11/09	01/12/09	Approved changes to University policies	Y	SM
51. Implement policy changes	07/12/09	06/01/10	Policy changed published and communicated		SM

WORKPACKAGE 5: Dissemination					
<i>Objective: Dissemination of guidelines and resources for HE</i>					
5a. Project website and resources					
52. Creation of project website	15/12/08	22/12/08	UEA Website for project	Y	SM/ RA
53. HE Guidelines and toolkits - data centres	07/01/10	06/02/10	Guidelines to assist in improving sustainability of data centres	Y	SM/ RA
54. HE Guidelines and toolkits - end user computing	09/01/10	08/02/10	Guidelines to assist in improving sustainability of desktop computer provision	Y	SM/ RA
55. 5b. UEA hosted conference/workshop on implementing sustainable ICT services	28/09/09	28/10/09	Conference and workshops - Sustainable ICT Service Provision	Y	SM/ RA
5c. Best practice video for ICT services					
56. Agree aim and approach	12/01/09	19/01/09	Aim, style and type of content agreed	Y	SM/ GM
57. Consult with linked projects and UEA stakeholders	02/02/09	03/04/09	Identify contributors and potential material		SM/ RA
58. Determine detailed list of content	04/03/09	18/03/09	List of content	Y	SM/ RA
59. Start recording material	01/04/09	28/10/09	Test recorded material		GM
60. Review, identify final material and film	28/09/09	27/11/09	First draft of material		GM/ RA
61. Editing	27/11/09	27/12/09	Edited draft of material		GM
62. Review, complete edit and produce master	01/02/10	03/03/10	Master copy produced		GM
63. Released to HE community	03/03/10	10/03/10	Video published	Y	SM/ RA
64. 5d. Project Board and JISC final reports	26/02/10	12/03/10	Final reports for UEA Project Board Final reports for JISC	Y	SM

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Date: 17/11/08

Members of Project Team:

RA	Research Assistant	Appointed for project	Information Services Directorate
SM	Steve Mosley	Project Manager	Information Services Directorate
DB	Dominic Belisario	Head of Desktop Services and Computer Suite	Information Services Directorate
TB	Dr. Tony Bagnall	Senior lecturer (Time series and data mining)	School of Computer Science
KT	Dr. Keith Tovey	Reader (Energy research)	School of Environmental Sciences
MN	Martyn Newton	Risk and Sustainability Manager	Estates
PT	Paul Totton	Building Management Systems Manager	Estates
IR	Iain Reeman	ICT Systems Director	Information Services Directorate
NW	Neil Wilson	Deputy Operations Manager	Estates
Tech	Project Technician	Appointed for project	Information Services Directorate
AW	Alan Wilson	IT Support Manager (HUM & Central)	Information Services Directorate
SE	Steve Edwards	Electrical Services Design Engineer	Estates
GM	Glen Medlar	Media Producer	Audio Visual Service