



JISC Project Plan

Overview of Project

1. Background

Outline Project Description

Like all Universities, Bolton has experienced a 50% increase in energy bills over the last year and is anticipating an 100% increase in the coming year. Managing down energy usage is a business and ethical imperative. The University efforts, to date, have focused on the efficient use of space and resources, which culminates now with the closure of the Chadwick campus and consolidation onto one campus. Beyond small scale applications of green initiatives, "Switch it Off" campaigns etc, the University has not had the resources to assess which green computing technologies and approaches would give the greatest benefit. Modest savings in one area are often wiped out by growth in consumption in another. Computer intensive disciplines continue to demand increasing processing power with consequent heat generation and increasing electricity consumption..

The Deane site houses the School of Games, Computing and Creative, Technology, the School of Built Environment and Engineering, and the Bolton Business School. In total the Deane campus has 350 student workstations located in 14 computer rooms, specialist laboratories, a 120 machine server farm and a medium size data centre housing 36 servers including a SAN, and thin client clusters. Over recent years sections of the site have been refurbished and air conditioning has been retrofitted. However, the majority of computer teaching rooms are located in older areas, and due to the construction of the building temperatures regularly exceed 28°C. These rooms contain high end workstation used for computer games development, digital rendering, video and special effects work. There is considerable pressure from staff and students to install air-conditioning to achieve a more comfortable learning environment.

The ECCILES project will use the TRIZ innovation methodology to develop a deep understanding of the problem domain and to generate a range of solutions. From these the best fit solutions will be implemented and their effectiveness will be measured. Key to the successful evaluation is the means to monitor consumption at a finer grain than at present and to be able to measure improvements.

2. Aims and Objectives

The ECCILES project aims to reduce the current power consumption arising from computing intensive teaching and learning spaces at the Deane Site of the University. The TRIZ Innovation methodology will be used to derive and select a holistic set of set of solutions suitable for green computing in a 1960s building. The specific aims are to

1. To constrain, reduce the growth, or reduce power consumption, directly and in-directly, due to the use of computers at Deane
2. To develop a deep understanding of the factors (going beyond the symptoms) that encourage the growth in power consumption around computing environments at Deane

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3. To explore and demonstrate the practical use of TRIZ as a structured methodology for tackling complex technical problems and innovate in Universities, feeding this back to the JISC innovation programme

The project objectives are

1. To establish a means of effectively measuring improvements in consumption or potential consumption of electricity at Deane, by establishing finer grain systems that monitor power consumption to areas of activity e.g. computer classrooms, computer server rooms, staff personal computer
2. To establish a base line for power consumption at Deane from which improvements can be measured.
3. To build a multi disciplined team capable of breaking down problems and identifying solutions using the TRIZ methodology
4. To use TRIZ methodology to produce a comprehensive assessment of the problems and factors influencing energy consumption at Deane, looking beyond pure technology issues to pedagogical practice and administrative practice.
5. To use TRIZ to generate a wide range of possible solutions taking into account the resources available at Deane
6. To select and test energy reduction solutions and approaches, measuring their impact on consumption
7. To investigate the potential of Free air systems to reduce the need for cooling in computer rooms

3. Overall Approach

There are two main areas that the project will investigate: how to reduce the energy take directly due to the use of computers in teaching, learning and research; how to improve on the current problem of heat management in computer classrooms without resorting to higher energy consuming air conditioning systems.

The project relies on engaging the whole Deane community in being aware of, and understanding, the issues so that energy conservation becomes a factor in planning, in user expectations and ultimately changes behaviours and attitudes.

Strategy and/or Methodology

The project is structured into four work packages. The breakdown of work packages can be found in Appendix B.

Broadly the process will be

1. To build a multi-discipline project teams from staff based at Deane and to introduce them to the TRIZ methodology through a series of training workshops.

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2. Carry-out an energy audit on Deane focusing on electricity usage and identifying problem areas e.g. overheating classrooms, air condition failures
3. Put in place monitoring devices that can measure power consumption in discrete circuits and to base line each circuit
4. Set-up facilitated working groups working on problem refinement and solution generation
5. Select solutions based on cost-benefit or other criteria
6. carry-out any necessary development of those solutions e.g. control devices, software
7. Implement solution
8. Measure the impact of the solution

Ideally, once established the project will emerge with iterative cycles of action between steps, of developing a set of solutions that can be discretely applied so that their effect can be measured.

9. Produce a results set and a report on the project outcomes.

Important Issues to be Addressed

Technology issues

- The means of measuring power consumption would ideally be linked to the University's building management system so that there is a long term ability to measure and control consumption. However, until an audit is carried out, it's not clear how big and costly a task this might be. An alternative strategy is to sample consumption over time in discrete zones and use these figures to build a model for similar environments.
- During the course of the project it is quite possible that the configuration of the site may change and that these changes may impact positively or negatively on the results of solutions.
- Any electrical control technologies that are developed as part of the project may not move beyond the proof of concept phase because of issues of compliance with safety standards e.g. the CE standard

Human system issues that may arise

- There is a strong possibility that the Hawthorne effect may occur where behaviours of staff change because of their awareness of the project, this could make measuring the effectiveness of some solutions difficult as it might not be clear where the saving is coming from. However, changing behaviours would also be a positive result of the project provided that they are sustained beyond the project term.

Scope

The ECCILES project will cover

1. Data gathering and monitoring strategies for computing activities related power consumption including:

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- a. Power consumption of computer devices and servers
 - b. Environmental related factors effecting associated with computers including temperature, power use by cooling technologies
 - c. Activity periods and types of activity e.g. timetable,
2. Use of TRIZ as a primary method for generating solutions
 3. Investigation into the options around free air cooling
 4. Investigation into development and use of control technologies and processes

The ECCILES project will NOT cover

1. Supply chain energy usage e.g. the energy used to manufacture a PC
2. Environmental sustainability and green issues beyond energy consumption e.g. impact of equipment disposal
3. Monitor power consumption of non computer related activities – e.g. lighting, manufacturing equipment or specialist laboratories
4. investigate non-electrical energy consumption at the site unless there is a clear connection to power usage

Critical Success Factors

The successful progress and delivery of the ECCILES project will be determined by the following CSF

1. A detailed model exists for the energy consumption factors around computer use at Deane
2. A 20% reduction on the energy consumption due to computer use at Deane in its current configuration i.e. without further cooling technologies applied
3. A costed plan is in place for optimising the temperature in computer teaching rooms at Deane
4. Staff and Student have greater awareness of the issues of energy consumption and there is evidence of changed behaviours

4. Project Outputs

Our JISC funded activity will deliver

- A portfolio of ICT energy reduction projects and actions derived using the TRIZ methodology
- An evaluation report on the viability of replacing air conditioning with free air cooling systems in computer intensive learning environments and buildings
- A report and evaluation on the outcome of each initiative taken
- Dissemination events on the use of TRIZ and systematic innovation methodology for problem solving around green computing
- A system for monitoring discrete local electrical circuits, transforming data into easily readable information formats made available using web services and widgets.
- Prototype control devices for reducing electricity consumption in computer labs, if these do not already exist.

5. Project Outcomes

At the end of the ECCILES project we expect

- To have a deep understanding (supported by data and models) of the factors around energy consumption in computing and computer teaching environments at Deane
- To have reduced the amount of electrical energy consumed by at least 25% relative to the computing activities at the site
- To have improved on the ambient heat problems in computer classrooms at Deane
- To have a set of tested approaches for manage down the energy consumption due to computers to inform the sustainability plan for the whole University.
- Better informed staff and students who are aware of their own contribution to energy consumption

6. Stakeholder Analysis

Stakeholder	Interest / stake	Importance
Academics	<ul style="list-style-type: none"> • Availability and suitability of computer teaching resources • Quality of the teaching environment • Own work practices and consumption • Awareness of energy overheads and energy costs of activities 	
Students	<ul style="list-style-type: none"> • Availability and suitability of computer teaching resources • Quality of the learning environment • Green reputation of the University 	
School of GCCT	<ul style="list-style-type: none"> • Capacity planning • Technical support 	
Purchasing manager	<ul style="list-style-type: none"> • Equipment Procurement policy • Energy supply procurement 	
Finance Dept	<ul style="list-style-type: none"> • Budgeting for Energy procurement 	
Estates Team	<ul style="list-style-type: none"> • Ability to predict energy usage • Energy capacity planning • Maintenance and quality of the physical learning environment 	
Computer Services	<ul style="list-style-type: none"> • Specification of computer systems and resources • Capacity planning • Availability planning • Maintenance and quality of the computing environment 	
Project Team	<ul style="list-style-type: none"> • Application and understanding of TRIZ 	
University	<ul style="list-style-type: none"> • Raise profile of green issues and sustainability agenda within the University 	

	<ul style="list-style-type: none"> • Contribution to energy sustainability and managing the carbon footprint • Better management of expenditure on energy • Transferrable models of energy efficiency for use elsewhere in the University 	
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7. Risk Analysis

Risk	Probability (1-5)	Severity (1-5)	Score (P x S)	Action to Prevent/Manage Risk
Staffing				
Finding appropriate staff with desirable skills mix.	1	4	4	Key staff already in place. University needs to engage person with energy management expertise to enable implementation of solutions. Initial contact with employment agency indicates this is unlikely to be a major problem.
Not being able to engage wide range of stakeholders from across the University (see stakeholder analysis above) in accepting and implementing project derived solutions.	1	5	5	Project will be overseen by the Deputy Vice Chancellor who as line management responsibility for all Senior Managers engaged with stakeholders. Providing the project implements realistic solutions backed by evidence and thorough financial analysis there is a commitment from the University Directorate to implement cost effective solutions arising from the project.
Organisational				
Multidisciplinary team from across the University not working to timescales and reporting schedules demanded by the project.	3	4	12	Strict adherence to project plan through monthly meetings involving key stakeholders with reports submitted to the project Steering Group chaired by the University Deputy Vice Chancellor.
Difficulty in achieving the balance between solutions derived from efficient use of existing resources (including staffing and computing facilities) and those requiring purchase and installation of capital equipment.	2	3	6	Project will be driven by the Project Steering Group to achieve the most cost effective solution for the University. Whilst that will mean minimising expenditure on capital equipment it will take into consideration longer term scenarios and their impact on operational efficiency and teaching quality. Additionally the TRIZ approach will ensure that all potential solution paths are effectively explored.
Too much emphasis on academic research and potential scenarios rather than practical application of	2	3	6	Strong project management and direction from the Project Management Board and Steering Group. Inclusions of Estates and

solutions.				facilities staff in project delivery will also ensure focus on a realistic and measurable outcome.
Technical				
Measurement of power consumption granularly to enable unit costs and benchmarks to be determined in order to determine energy "hot-spots" and confirm cost savings following implementation of solutions.	3	2	6	Spot measurements will be taken to estimate overall power consumption which will be confirmed through energy bills linked to particular areas within the campus.
Unable to achieve energy savings identified within project plan.	2	5	10	The University is committed to reducing the energy bill and can envisage that simply stricter management of the use of computing facilities will in itself bring about energy savings of at least 20% in relation to computer usage and heating/ventilating of associated rooms. The challenge will be to manage energy usage alongside improving access to computing facilities and the working environment.
Legal				
No legal risks envisaged.				

8. Standards

Name of standard or specification	Version	Notes
Non identified yet		The application of appropriate standards will be investigated as part of each sub project

9. Technical Development

The project will use the skills of the University's micro electronics development unit to source and adapt power monitoring tools that can be applied to discrete local circuits such that live data can be collected. This will be used in two ways: to monitor improvements in consumption; to generate live information feeds via web services and widgets. These will be used to raise the awareness and influence staff and student behaviours. For example a widget may show the current cost of electricity being used in an area or the carbon profile at any one time.

10. Intellectual Property Rights

All documents and media shall be made available under a Creative Commons Attribution license. All source code shall be made available under a MIT-style license.

The University confirms that the project is delivered in support of the open source ethos and sector development and as such there are no issues that relate to FOI or IPR.

Project Resources

11. Project Partners

The Ecciles project has no formal partnership or partnership arrangements.

12. Project Management

The project will be structure and managed in accordance with the University of Bolton's standard project management methodology and JISC's best practice guidelines.

- A project steering group will be established consisting of: -

Name	Role	Contact
Dr Peter Marsh (Chair)	Deputy Vice Chancellor, University of Bolton	p.marsh@bolton.ac.uk
Derek Rout	Head of Facilities	d.rout@bolton.ac.uk
TBA	Project Manager	
Alan Cornthwaite	Director of School of Built Environment and Engineering	a.cornthwaite@bolton.ac.uk
Patrick O'Reilly	Head of Information Systems and Technology	p.oreilly@bolton.ac.uk
Hilary Birtwistle	Head of Strategy, Policy and Development Support	H.Birtwistle@bolton.ac.uk

The project steering group will oversee changes to the project plan and facilitate any internal University issues that might arise, in order to ensure a smooth transition though the project.

The project Steering group is scheduled to meet in October 08, February 09, September 09 and February 10 to consider and review progress including approving the project plan, project methods, system design, testing and roll-out. Where needed the project steering group will meet on an ah-hoc basis where significant issues arise that need wider organisational consultation, facilitation and change.

A project team will be established consisting of members drawn from across the Deane community

Name	Role	Contact
Derek Rout	Project Director – Head of Facilities	
TBA	Project Manager	d.rout@bolton.ac.uk
Patrick O'Reilly	IT policy and planning	p.oreilly@bolton.ac.uk
Professor Danny Morton	TRIZ support	d.morton@bolton.ac.uk
Hilary Birtwistle	Project support	H.Birtwistle@bolton.ac.uk
Roger Kirkman	Computer and Systems support	R.A.Kirkman@bolton.ac.uk
Margaret Nelson	Building environment expertise	M.Nelson@bolton.ac.uk
Mike Lawrence	Micro electronics support	M.Lawrence@bolton.ac.uk
Kevan Smart	Micro electronics support	K.Smart@bolton.ac.uk

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Mark Williamson	Computer and Systems support	M.E.Williamson@bolton.ac.uk
Researcher	Data analysis and modelling	
Damien Markey	GCCT School representation	D.M.Markey@bolton.ac.uk

The project manager will spend an average of 5 days per week supporting the project organisation, administration and document outputs.

The project will operate with sub project teams investigating different problem areas.

Project Communication

The project will communicate progress, development and finding in the following ways

- Internally, developments will be shared across the University through demonstrations and involvement in staff development activities.
- The project will maintain a project website and blog of developments
- All meetings will produce a set of action minutes and decisions which will be published and shared
- The project team will take parting in programme meeting and share all findings and ideas with others in the programme
- Findings will be documented in the mid project report and the final project report
- All findings will be disseminated at the end of project meeting and all reports will be made available to the JISC community

13. Programme Support

<Indicate if there are specific areas where you would like support from the programme or programme manager.>

None envisaged at this stage.

14. Budget

See Appendix A.

The budget remains fundamentally unchanged at this time, however should this position change an amended budget will be submitted to JISC for approval with justification.

Detailed Project Planning

15. Workpackages

*<Use the workpackages template to plan the detailed project work and attach as Appendix B. Clearly indicate project deliverables and reports (in **bold**), when they are due, phasing of workpackages, and explain any dependencies. You may also attach a Gantt chart, diagram, or flowchart to illustrate phasing.>*

See Appendix B

16. Evaluation Plan

<Indicate how you will evaluate the quality of the project outputs and the success of the project. List the factors you plan to evaluate, questions the evaluation will answer, methods you will use, and how success will be measured. Expand as appropriate on how you will conduct the evaluation.>

Timing	Factor to Evaluate	Questions to Address	Method(s)	Measure of Success
End of project	Achievements against aims and objectives	Have objectives been met?	Review by the steering group of stakeholder feedback	20% reduction in electricity usage (before free air cooling is applied)
WP 3 WP4	Outcomes and impacts	Can a solution be practically implemented? What are the key project findings? Have outcomes been achieved?	Prototyping and testing Cost benefit analysis Internal peer group evaluation Stakeholder review	The method works and can be feasibly installed and operated. The solution give a payback in reducing energy consumption or improving the quality of the environment. Project technical reports are produced and agreed Evidence of changes in behaviour Positive feedback from stakeholders
End of Project report	Benefits	Has the project provided the expected benefits?	End of project review	The data post implementation shows improvements in energy reduction, quality of computer teaching environment and user perception/understanding.
	Learning	Is there evidence of transfer of skills within the project team to sustain a production system?	Evaluation report and project review	Project members feel able to engage with and use TRIZ
		Have the lessons of the project been adequately disseminated?	Peer review	Feedback from all involved parties – Steering group, Stakeholders and JISC community.
	Effectiveness of the project	Is the project management effective?	Project Board and project team	Workpackages are completed and signed off

		Were agreed outputs delivered on time?	review ditto	No more than 1 month deviation from the project plan for each WP.
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17. Quality Plan

<Explain the quality assurance procedures you will put in place to ensure that project deliverables meet quality expectations and acceptance criteria. Complete the table below for each of the major deliverables providing as much detail as possible. Repeat the table as many times as necessary to accommodate all deliverables.>

Output	<i>A portfolio of ICT energy reduction projects and actions derived using the TRIZ methodology</i>				
Timing	Quality criteria	QA method(s)	Evidence of compliance	Quality responsibilities	Quality tools (if applicable)
	Usability of solutions	Acceptance testing and results measurement	User feedback is positive	Project manager	Interview and survey
	Fitness for purpose	Acceptance testing	Solutions show a reduction in energy take	Project manager	Quantitative measurement on energy before and after implementations
Output	<i>An evaluation report on the viability of replacing air conditioning with free air cooling systems in computer intensive learning environments and buildings</i>				
Timing	Quality criteria	QA method(s)	Evidence of compliance	Quality responsibilities	Quality tools (if applicable)
	Concise, complete, accurate and useable reports	presentation to board and executive	Existence of the report, Exec Minutes	Project Manager	Project team and board review
Output	<i>A report and evaluation on the outcome of each initiative taken</i>				
Timing	Quality criteria	QA method(s)	Evidence of compliance	Quality responsibilities	Quality tools (if applicable)
Output	<i>Dissemination events on the use of TRIZ and systematic innovation methodology for problem solving around green computing</i>				
Timing	Quality criteria	QA method(s)	Evidence of compliance	Quality responsibilities	Quality tools (if applicable)
Output	<i>A system for monitoring discrete local electrical circuits, transforming data into easily readable information formats made available using web services and widgets.</i>				

Timing	Quality criteria	QA method(s)	Evidence of compliance	Quality responsibilities	Quality tools (if applicable)
	Usability of solution	Acceptance testing	User feedback is positive	Project manager	
	Fitness for purpose	Acceptance testing	Satisfies acceptance criteria.	Project manager	
	Adherence to JISC open source policy	Checks against the policy	Any code, procedures, configuration advice will be freely disseminate	Project manager	
Output	<i>Prototype control devices for reducing electricity consumption in computer labs</i>				
Timing	Quality criteria	QA method(s)	Evidence of compliance	Quality responsibilities	Quality tools (if applicable)
	Usability of solution	Acceptance testing	User feedback is positive	Project manager	
	Safety of solution	Electrical compliance testing	Test results	Project manager	To be selected
	Fitness for purpose	Acceptance testing	Satisfies acceptance criteria.	Project manager	
Output	Final Report				
Timing	Quality criteria	QA method(s)	Evidence of compliance	Quality responsibilities	Quality tools (if applicable)
	Energy reduction	Modelling and profiling	Reduced energy profile	Project manager	Monitoring equipment
	Improvement in learning environment	Staff and student feedback Environment sampling	Positive feedback Temperature stability and range	Project Manager	Survey tool Quantitive measurements

18. Dissemination Plan

<Explain how the project will share outcomes and learning with stakeholders and the community. List important dissemination activities planned throughout the project, indicating purpose, target audience, timing, and key message.>

Timing	Dissemination Activity	Audience	Purpose	Key Message
Dec 2008	Establish a project blog	JISC + University Community	Share project objectives, rationale and progress. To share the learning experience and highlight any problems resulting from protective system/data ownership, internal politics, resistance to change and other related issues.	The benefits and problems encountered.
Dec 2008	Initial project plan	JISC and project stakeholders	Set out the project scope, methods, timescale and targets	Awareness of activity and structure of the project engagement
Feb2009	TRIZ workshops and internal project publicity	UoB Staff at Dean	To build a community of experts in the problem area who can contribute to refining the problem and generating solutions	Introduction to issues and problem solving techniques
July 2009	Interim Project Report	JISC Community and project stakeholders.	Report of project progress and issues.	Progress against plan.
March 2010	Final Project Report	JISC Community	Overall evaluation of the experience, learning and outputs	Here are the problems we encountered and the successes we achieved.
April 2010	Project Presentation	JISC Community	Presentation of methods, findings and results	Here are the problems we encountered and the successes we achieved.

Throughout the duration of the project regular entries will be posted to the project blog. Other issues covered in the submitted documentation will include details of related staff development activities that will be necessary in order to ensure that appropriate processes become embedded within the University.

19. Exit and Sustainability Plans

<Explain what will happen to project outputs at the end of the project (including knowledge and learning). Focus on the work needed to ensure they are taken up by the community and any work needed for project closedown, e.g. preservation, maintenance, documentation.>

Project Outputs	Action for Take-up & Embedding	Action for Exit
portfolio of ICT energy reduction projects and actions	Successful interventions that show a return on investment will be applied more widely within the University	
Assessment of viability of replacing air conditioning with free air cooling systems	Where viable in this environment the University will adopt free air cooling as an alternative to air conditioning	Complete free air adoption programme
the use of TRIZ and systematic innovation methodology for problem solving around green computing	The learning from the TRIZ application will be developed as a case study to be used with other projects and knowledge transfer activities	Produce case study
system for monitoring discrete local electrical circuits, transforming data into easily readable information formats made available using web services and widgets	The power monitoring will be rationalised and left in place so that useful monitoring can continue and be used to inform future changes and policy	Remove temporary monitoring devices
Prototype control devices for reducing electricity consumption in computer labs, if these do not already exist	The details of any devices, coding produced or specifications will be made available within the JISC community	Deposit code in open source repository e.g. sourceforge
Learning from the project	Lessons learned will be used to inform other project through the increased understanding of the project team	Project review

<List any project outputs that may have potential to live on after the project ends, why, how they might be taken forward, and any issues involved in making them sustainable in the long term.>

Project Outputs	Why Sustainable	Scenarios for Taking Forward	Issues to Address
Energy reduction techniques	The selected techniques will be those that have show a reasonable return on investment	Application to other areas of the University including the Eagle site	Possible changes in working practices and to the availability of resources
Free air cooling	There are other areas of the University which may benefit from the approach	Incorporation into new build or reconfiguration projects were applicable	Costs and feasibility may be unique to individual locations
Any control devices, or software produced	The selected techniques will be those that have show a reasonable return on investment	To apply these techniques in other similar locations and configurations to maximise overall savings	May be compliance issues that need to be addressed

Appendix A. Project Budget

Directly Incurred Staff	Sept 08 - July 09	August 09 – February 10	TOTAL £
Project Director 0.4fte Senior Manager 45k pa net	21,160	13,857	35,017
Project Manager 1fte 37k pa net	43,489	28,480	71,969
Senior Design Engineer 0.4fte 36k pa net	14,974	9,848	24,822
TRIZ developer 0.2fte 45k pa net	10,576	6,928	17,504
Applications Manager 0.2fte 36k pa net	7,519	4,923	12,442
Programme Developer 0.5fte 31k pa net	14,684	9,617	24,301
Total Directly Incurred Staff (A)	112,402	73,653	186,055
Non-Staff			
Travel and expenses	2,000	2,000	4,000
Hardware/software/monitoring equipment	36,598	11,402	48,000
Dissemination	2,000	2,000	4,000
Evaluation	5,000	2,500	7,500
Other Bursaries	30,000	15,000	45,000
Consumables	2,000	1,000	3,000
Estates infrastructure	75,000	75,000	150,000
Professional Services	10,000	5,000	15,000
Total Directly Incurred Non-Staff (B)	162,598	113,902	276,500
Directly Incurred Total (A+B=C) (C)	275,000	187,555	462,555
Directly Allocated			
Staff (administrator, steering group and advisory group)	10,000	5,000	15,000
Staff Development Events	10,000	5,000	15,000
Directly Allocated Total (D)	20,000	10,000	30,000
Indirect Costs (E)	112,000	71,273	183,273
Total Project Cost (C+D+E)	407,000	268,828	675,828
Amount Requested from JISC	200,000	100,000	300,000
Institutional Contribution	207,000	168,828	375,828
Percentage Contributions over the life of the project	JISC 44.4%	UNIVERSITY 55.6%	Total 100%

Nature of Institutional Contributions

Directly Incurred Staff			
Post, Grade & % FTE See above	0	0	0
Directly Incurred Non Staff			
Hardware/Software etc.	75,000	87,555	162,555
Directly Allocated			
Staff, Estates etc.	20,000	10,000	30,000
Indirect Costs			
Indirect Costs	112,000	71,273	183,273
Total Institutional Contributions	207,000	168,828	375,828



Appendix B Workpackages

WORKPACKAGES	Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
		N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A
1: Set-up phase and admin																			
2: Monitoring and Benchmarking																			
3: TRIZ computing projects																			
4: Computing Environment projects																			

Project start date: 01-11-2008

Project completion date: 30-04-2010

Duration: 18 months

<i>Workpackage and activity</i>	Earliest start date	Latest completion date	Outputs (clearly indicate deliverables & reports in bold)	Milestone	Responsibility
<i>WORKPACKAGE 1: Project Set-up and administration</i> <u>Objective:</u> To establish the project structure teams and roles. Develop knowledge of the concepts of TRIZ in project groups	Nov 08	April 10			
1. Appoint a Project Manager	Nov 08	Jan 09			
2. TRIZ Workshop for Project Team	Nov 08	Nov 08			DM
3. Recruit a Project Technical Leader	Jan 09	Mar 09			DR
4. Produce the detailed Project plan	Oct 08	Dec 08	Project Plan	<input checked="" type="checkbox"/>	Project Manager
5. Put in place a communication plan around the project	Feb 09	April 10	Communication action plan for staff, student		Project Manager
6. Produce the mid-term project progress report	Jul 09	Aug 09	Mid Term project review document		Project Manager
7. Produce Final project report	Mar 10	April 10	Final Project Report	<input checked="" type="checkbox"/>	Project Manager
<i>WORKPACKAGE 2: Monitoring and base lining</i> <u>Objective:</u> To establish a base line for power consumption at Deane from which improvements can be measured	Dec 08	May 09			
8. Carry out an audit of electrical distribution at Deane	Dec 08	Feb 09	Record of power distribution, updated building drawings		DR

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9. Audit computer resources at Deane	Jan 09	Feb 09	Inventory of room, equipment spec, room power configuration, timetable		PO
10. Put in place monitoring equipment and take measurements	Jan 09	May 09			PTL
11. Measure user awareness	Mar 09 Jan 10	Jun 09 Mar 10	Survey of user perception (staff and student)		Researcher
12. Baseline power consumption in individual computer rooms	Feb 09	April 09	Spreadsheet of room, power usage, room utilisation and use	<input checked="" type="checkbox"/>	Researcher
13. Build cost and carbon models	Feb 09	May09	Spreadsheet of consumption costs and carbon	<input checked="" type="checkbox"/>	Researcher
WORKPACKAGE 3: Objective: To use TRIZ methodology to produce a comprehensive assessment of the problems and factors influencing energy consumption at Deane, looking beyond pure technology issues to pedagogical and administrative practice.	Feb 09	April 10			
14. Establish the Round 1 TRIZ working groups and agree problem areas e.g. technology, admin and curriculum, technology procurement practices		Feb 09			DM
15. Working groups apply systematic innovation tools to problem areas	Feb 09	June 09			DM
16. Round 1 summary reports or presentation	Jun 09		Range of proposed solutions		DM
17. Select and evaluate solutions for ROI and technical feasibility	Jun 09	July 09	Cost benefit analysis of selected solution		DM, PO, PTL
18. Pilot solutions	July 09	Oct 09	Developed prototypes, configs, policies		PO, KS, RK
19. Measure impact of solutions	Oct 09	Jan 10	Mini reports on effectiveness of solutions	<input checked="" type="checkbox"/>	Researcher
20. Establish the 2 nd Round TRIZ working groups and agree problem areas		Sept 09			DM
21. Working groups apply systematic innovation	Sept 09	Dec 09	TRIZ analysis completed		DM

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tools to different problem areas					
22. Round 2 summary reports or presentation	Jan 10		2 nd range of proposed solutions		DM
23. Select and evaluate solutions for ROI and technical feasibility	Jan 10	Feb 10	Cost benefit analysis of selected solution		DM, PO, PTL
24. Pilot solutions	Feb 10	April 10	Developed prototypes, configs, policies		PO, KS, RK
25. Measure impact of solutions	Mar 10	April 10	Mini reports on effectiveness of solutions	<input checked="" type="checkbox"/>	
WORKPACKAGE 4: Computing Environment Projects	Mar 09	Mar 10			
Objective: To investigate the potential for alternative temperature control/ cooling in Computer rooms including evaluation of free air systems					
26. Engage Free Air consultant	Mar 09	April 09			DR, PTL
27. Establish Temperature monitoring across target rooms	Mar 09	Nov 09	Spreadsheet relating air temperature outside to inside		Researcher
28. Design Free air solution	April 09	May 09	Design Proposal		PTL
29. Assess costs and feasibility of solution	May 09	June 09	Assessment report	<input checked="" type="checkbox"/>	PTL
30. Install in test rooms	Aug 09	Sept 09	Test installation		PTL
31. Monitor effectiveness	Sept 09	March 10			PTL
32. Produce effectiveness report	March 10	March 10	Report on the Effectiveness of Free air solutions in computer classrooms and server rooms	<input checked="" type="checkbox"/>	PTL

Members of Project Team:

DR	- Derek Rout	DM	- Danny Morton
PO	- Patrick O'Reilly	RK	- Roger Kirkman
MW	- Mark Williamson	KS	- Kevin Smart
PTL	- Project Technical Leader (to be appointed)		