



## JISC Project Plan

### *Overview of Project*

#### **1. Background**

*<Summarise the background to the project (and how it builds on previous work) and the need for it (and why it's important).>*

##### **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 refurbish 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**

*<List the broad aim or purpose of the project, and the specific objectives you intend to achieve.>*

The ECCILES project aims to reduce the current power consumption due to computing intensive teaching and learning spaces at the Deane Site of the University by using the TRIZ Innovation methodology 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

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Contact: Chris Frost (c.frost@bolton.ac.uk)  
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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
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

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

1. To establish a base line for power consumption at Deane from which improvements can be measured.
2. To build a multi disciplined team capable of breaking down problems and identifying solutions using the TRIZ methodology
3. 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.
4. To use TRIZ to generate a wide range of possible solutions taking into account the resources available at Deane
5. To select and test energy reduction solutions and approaches, measuring their impact on consumption
6. 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 heat current problem of heat management in computer classrooms without resorting to higher energy consuming air conditioning systems. The

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

- *Strategy and/or methodology and how the work will be structured*

The project is structured into seven 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 team from staff based at Deane and to introduce them to the TRIZ methodology through a series of training workshops.
2. Set-up facilitated working groups working on problem refinement and solution generation
3. Carry-out an energy audit on Deane focusing on electricity usage and identifying problem areas e.g. overheating classrooms, air condition failures
4. Put in place monitoring devices that can measure power consumption in discrete circuits and to base line each circuit
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:
  - 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"> <li>• Availability and suitability of computer teaching resources</li> <li>• Quality of the teaching environment</li> <li>• Own work practices and consumption</li> <li>• Awareness of energy overheads and energy costs of activities</li> </ul>	
Students	<ul style="list-style-type: none"> <li>• Availability and suitability of computer teaching resources</li> <li>• Quality of the learning environment</li> <li>• Green reputation of the University</li> </ul>	
School of GCCT	<ul style="list-style-type: none"> <li>• Capacity planning</li> <li>• Technical support</li> </ul>	
Purchasing manager	<ul style="list-style-type: none"> <li>• Equipment Procurement policy</li> <li>• Energy supply procurement</li> </ul>	
Finance Dept	<ul style="list-style-type: none"> <li>• Budgeting for Energy procurement</li> </ul>	
Estates Team	<ul style="list-style-type: none"> <li>• Ability to predict energy usage</li> <li>• Energy capacity planning</li> <li>• Maintenance and quality of the physical learning environment</li> </ul>	
Computer Services	<ul style="list-style-type: none"> <li>• Specification of computer systems and resources</li> <li>• Capacity planning</li> <li>• Availability planning</li> <li>• Maintenance and quality of the computing environment</li> </ul>	

Project Team	<ul style="list-style-type: none"> <li>• Application and understanding of TRIZ</li> </ul>	
University	<ul style="list-style-type: none"> <li>• Raise profile of green issues and sustainability agenda within the University</li> <li>• Contribution to energy sustainability and managing the carbon footprint</li> <li>• Better management of expenditure on energy</li> <li>• Transferrable models of energy efficiency for use elsewhere in the University</li> </ul>	

## 7. Risk Analysis

Risk	Probability (1-5)	Severity (1-5)	Score (P x S)	Action to Prevent/Manage Risk
<b>Staffing</b>				
<b>Organisational</b>				
<b>Technical</b>				
<b>Legal</b>				

## 8. Standards

<List the standards the project will use in the table below. Also indicate:

- Any deviations from the standards that JISC recommends.
- Where choices exist in an area, the reasons for the standards selected.
- Where proprietary standards are selected in an area where open ones are available, the reasons for their use and their scope of deployment.>

Name of standard or specification	Version	Notes

## 9. Technical Development

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Date: 4<sup>th</sup> August 2008

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

*<Briefly describe the project management framework, including organisation, reporting relationships, decision process, and the role of any local management committee.*

*List all members of the project team, their roles, and contact details. Indicate the proportion of time the project manager will spend on project management.*

*Indicate if the project has training needs and how they will be met.>*

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
Alan Cornthwaite	Director of School of Built Environment and Engineering	
Patrick O'Reilly	Head of Information Systems and Technology	p.oreilly@bolton.ac.uk
Derek Rout	Head of Facilities	
Hilary Birtwistle	Head of Strategy, Policy and Development Support	

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 through the project.

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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 ad-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	
Patrick O'Reilly	IT policy and planning	p.oreilly@bolton.ac.uk
Dr Danny Morton	TRIZ support	
Hilary Birtwistle	Project support	
Roger Kirkman	Computer and Systems support	
Margaret Nelson	Building environment expertise	
Mike Lawrence	Micro electronics support	
Kevan Smart	Micro electronics support	
Mark Williamson	Computer and Systems support	
Researcher	Data analysis and modelling	
Damien Markey	GCCT School representation	

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.>*

### 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
	Achievements against aims and objectives	Have objectives been met?	Review by the steering group of stakeholder feedback	
	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	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  Positive feedback from stakeholders

			review	
	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?  Were agreed outputs delivered on time?	Project Board and project team review  ditto	Workpackages are completed and signed off  No more than 1 month deviation from the project plan for each WP.

## 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.>

<b>Output</b>	<i>A portfolio of ICT energy reduction projects and actions derived using the TRIZ methodology</i>				
<b>Timing</b>	<b>Quality criteria</b>	<b>QA method(s)</b>	<b>Evidence of compliance</b>	<b>Quality responsibilities</b>	<b>Quality tools (if applicable)</b>
	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
<b>Output</b>	<i>An evaluation report on the viability of replacing air conditioning with free air cooling systems in computer intensive learning environments and buildings</i>				
<b>Timing</b>	<b>Quality criteria</b>	<b>QA method(s)</b>	<b>Evidence of compliance</b>	<b>Quality responsibilities</b>	<b>Quality tools (if applicable)</b>
	Concise, complete, accurate and useable	presentation to board and executive	Existence of the report, Exec Minutes	Project Manager	Project team and board review

<b>Output</b>	<i>A report and evaluation on the outcome of each initiative taken</i>				
<b>Timing</b>	<b>Quality criteria</b>	<b>QA method(s)</b>	<b>Evidence of compliance</b>	<b>Quality responsibilities</b>	<b>Quality tools (if applicable)</b>
<b>Output</b>	<i>Dissemination events on the use of TRIZ and systematic innovation methodology for problem solving around green computing</i>				
<b>Timing</b>	<b>Quality criteria</b>	<b>QA method(s)</b>	<b>Evidence of compliance</b>	<b>Quality responsibilities</b>	<b>Quality tools (if applicable)</b>
<b>Output</b>	<i>A system for monitoring discrete local electrical circuits, transforming data into easily readable information formats made available using web services and widgets.</i>				
<b>Timing</b>	<b>Quality criteria</b>	<b>QA method(s)</b>	<b>Evidence of compliance</b>	<b>Quality responsibilities</b>	<b>Quality tools (if applicable)</b>
	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	
<b>Output</b>	<i>Prototype control devices for reducing electricity consumption in computer labs</i>				
<b>Timing</b>	<b>Quality criteria</b>	<b>QA method(s)</b>	<b>Evidence of compliance</b>	<b>Quality responsibilities</b>	<b>Quality tools (if applicable)</b>
	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	
<b>Output</b>	<b>Final Report</b>				
<b>Timing</b>	<b>Quality criteria</b>	<b>QA method(s)</b>	<b>Evidence of compliance</b>	<b>Quality responsibilities</b>	<b>Quality tools (if applicable)</b>
	Energy reduction	Modelling and profiling	Reduced energy profile	Project manager	Monitoring equipment
	Improvement	Staff and student	Positive	Project Manager	Survey tool

	in learning environment	feedback Environment sampling	feedback Temperature stability and range		Quantitive measurements
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## 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 2009	Final Project Report	JISC Community	Overall evaluation of the experience, learning and outputs	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





## Appendix B. Workpackages

### Work Package 1: With the use of TRIZ, review problem areas and areas of focused solutions.

**Objectives:** To establish the project; familiarize key stakeholder with the TRIZ methodology and the problem area. To establish TRIZ work teams, agree objectives and undertake development/solution workshops.

**Methodology:** A number of Training workshops will be run in the Innovation Factory. These will be followed by facilitated group working on problem refinement and solution generation

**Deliverable:** report on the possible solutions identified

### 24 Work Package 2: Identify solution strands

**Objectives:** To select and assess the viability of proposed solutions

**Methodology:** put in place monitoring equipment and baseline energy consumption. Carry out small scale experimentation or other means to assess viability of solutions. Select the best bet solutions based on cost/benefit and efficacy.

**Deliverable:** Detailed requirements document identifying areas of change and supporting actions.

### 25 Work Package 3: Planning

**Objectives:** To establish each problem/solution area as a sub-project

**Methodology:** a project plan will be developed by the project team, led by the project manager, comprising a detailed timeline and method for each of the various solutions.

**Deliverables:** Individual project metrics and detailed implementation plans

### 26 Work Package 4: Implementing

**Objectives:** To model and where possible trial and evaluate the new processes in defined areas prior to full implementation .

**Methodology:** Piloting and evaluation will be a continuous process throughout the project. **Deliverables:** Test completion reports

### 27 Workpackage 5: Embedding the innovations, evaluate full implementation

**Objectives:** To put in place full solutions or embed new processes and evaluate implantation making necessary adaptations as required, in particular to facilitate flexibility of application to a broader range of space configurations.

**Methodology:** Carry out implementation strategies and actively monitor improvement/degradation and problems that arise.

**Deliverable:** Evaluation reports on solutions

### 28 Workpackage 6: Dissemination and collaboration.

**Objective:** to work with JISC programme to disseminate lessons learnt and to learn from others, working with Support project.

**Methodology:** To collaborate fully with the JISC support programme, and to make available the lessons learnt through publications and workshops, project blogs and utilising professional networks including UCISA and Pro Vice Chancellors' forum

**Deliverables:** A project blog. A cluster of cases studies on a each solution deployed. A final evaluation report incorporating an assessment on the use of TRIZ in this area and recommendations for other seeking to implement similar innovations.

### 29 Workpackage 7: Project management

**Objectives:** to deliver a well run and successful project whose outcomes meet the strategic needs of the university, its staff, students and clients.

**Methodology:** This project combines research into practical solutions that TRIZ generates with action to implement new techniques and monitoring mechanisms that will permit more informed strategic decision making in terms of future actions to mitigate costs and carbon emission issues in the future. The timeline for such an ambition project will require that the management of the project is based on achieving the practical outputs as well as the shared knowledge that is an expectation.

**Deliverables:** Project reports (twice yearly), project plan (revised 6 monthly), reflective logs. Final project sign off report.