Salix Finance
Energy Efficient ICT Workshop – Nottingham Trent University

23rd September 2010

Our mission is to work with the public sector to reduce carbon emissions through investment in energy efficiency and renewable technologies.

Salix Finance - agenda

Programme

10.00 – 10.30	Registration & Coffee
10.30 – 10.40	Welcome & Energy Efficiency at Nottingham Trent *Scott Brooks, Utility Engineer*
10.40 – 11.10	Salix funding and ICT *Paul Smyth, Head of Technical Services, Salix Finance*
11.10 – 11.45	Energy Efficient Improvement Opportunities in ICT - Evidence from the SusteIT Project *Peter James, Professor of Environmental Management, University of Bradford and Director, SusteIT*
11.50 – 12.20	Case – Energy Efficient ICT at the University of Sheffield *Chris Cartledge, Consultant (and former staff member)*
12.20 – 12.50	Case – Energy Efficient ICT at Leeds Metropolitan University *Roland Cross, Technology Projects Consultant, and Colin Pattinson, Professor of Mobile and Converging Technologies*
12.50 – 13.50	Lunch

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Salix Finance – agenda

13.50 – 14.20	Cost-Effective Green IT Measures *Peter Hopton, representing the British Computer Society Data Centre and Green IT Specialist groups*
14.20 – 15.20	Small group discussion, followed by brief plenary feedback *Exchange of experience and ideas; How Estates and ICT staff can work together more effectively to identify and implement Salix-funded projects*
15.20 – 15.30	Developments at Salix Finance to support client delivery
15.30 (approx)	End

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Introduction

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Salix Finance - 09/10 delivery

09/10 Project delivery

	Year to 31 March 2010					
	Project Numbers (No.)	Value committed (£)	Annual CO2 (tonnes)	Lifetime CO2 (tonnes)	Annual Fin. Saving (£)	Lifetime Fin. Saving (£)
Recycling Fund	**946**	**18,853,603**	**31,992**	**450,146**	**5,509,503**	**76,226,621**
Loans (SEELS)	**1,435**	**57,380,609**	**84,220**	**1,218,974**	**14,016,728**	**202,047,250**
Loans Wales (SEELS)	**235**	**5,280,000**	**7,435**	**112,801**	**1,180,399**	**17,888,954**
Total	**2,616**	**81,514,212**	**123,647**	**1,781,921**	**20,706,630**	**296,162,825**

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Salix Finance – ICT's place in the RF

09/10 Recycling Fund - by client spend

#	Project Type	Number of Projects	Tech Cost
1	Lighting - Upgrades	216	£4,349,858
2	Voltage Reduction	98	£2,789,674
3	Boilers	87	£1,728,454
4	Motor Controls	110	£1,561,205
5	Heating	81	£1,508,620
6	Insulation - Building Fabric	129	£1,408,705
7	Building Management Systems	70	£1,255,643
8	Computers and IT	22	£1,227,076
9	Cooling	21	£1,074,077
10	Lighting - Controls	76	£808,643

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Salix Finance – ICT's place in the RF

09/10 Recycling Fund - by payback

#	Project Type	Number of Projects	Technology Payback (yrs
1	Computers and IT	22	1.71
2	Motor Controls	110	1.75
3	Office Equipment	1	2.11
4	Insulation - Pipework	109	2.19
5	Time Switches	27	2.42
6	Swimming	22	2.42
7	Street lighting	9	2.48
8	Boilers	87	2.79
9	Building Management Systems	70	2.92
10	Heating	81	2.95

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Salix Finance – ICT's place in the RF

09/10 Recycling Fund - by annual carbon saved (tonnes)

#	Project Type	Number of Projects	Annual CO_2 Savings (t)
1	Lighting - Upgrades	216	6,031.74
2	Voltage Reduction	98	5,225.96
3	Motor Controls	110	4,962.03
4	Computers and IT	22	4,368.92
5	Boilers	87	3,134.91
6	Heating	81	3,080.51
7	Building Management Systems	70	2,550.65
8	Insulation - Pipework	109	2,323.89
9	Insulation - Building Fabric	129	2,274.32
10	Cooling	21	1,597.37

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Salix Finance – ICT's place in the RF

09/10 Recycling Fund - by spend to save 1 Annual Tonne of carbon ↓

#	Project Type	Number of Projects	£ per Annual TCO2 Saved
1	Computers and IT	22	280.86
2	Motor Controls	110	314.63
3	Insulation - Pipework	109	318.19
4	Office Equipment	1	422.92
5	Time Switches	27	447.22
6	Street lighting	9	452.97
7	Swimming	22	455.25
8	Hot Water	14	458.34
9	Heating	81	489.73
10	Building Management Systems	70	492.28

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Salix Finance – ICT's place in the RF

09/10 Recycling Fund - by lifetime cost of carbon

#	Project Type	Number of Projects	Cash per tonne saved life time
8	Street lighting	9	38.44
9	Ventilation	6	39.16
10	Heating	81	42.67
11	Combined Heat and Power	2	43.08
12	Boilers	87	45.15
13	Renewable Energy	2	45.29
14	Lighting - Upgrades	216	45.84
15	Insulation	2	45.92
16	Time Switches	27	48.92
17	Motor Replacement	7	49.73
18	Computers and IT	22	51.85

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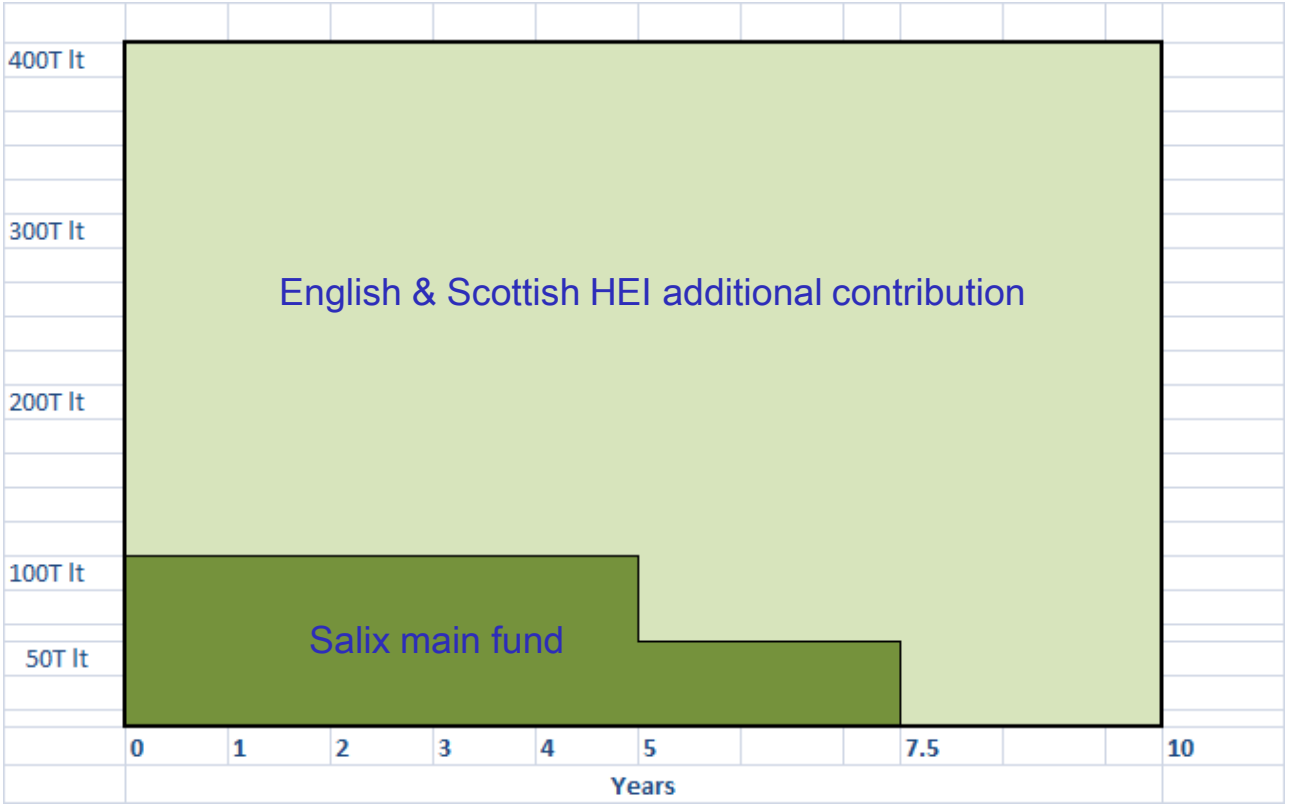
Salix Finance - ICT's projects in 10/11

10/11 Salix compliance rules & Carbon Trust Persistence Factors



Salix Finance - ICT's projects in 10/11

[10/11 Carbon Trust Persistence Factor for ICT & Office equipment]

CARBON TRUST

Make selections from the white boxes

Technology Group	Building technologies	**Maintenance Type**	Good Practice Maintenance
Main Technology	Equipment	**Max Life, User Field**	60
Sub Technology	Computers, printers and office equipment	**Discount Rate**	3.50%
Persistence Factor	3.00	**Financial Persistence Factor**	2.90
Useful Life	3	**Operational Degradation Type**	No deterioration
FACTOR 1 Inherent Degradation	100%	**FACTOR 2 Operational degradation**	100%
Examples of Carbon Reduction Investments:	Energy Star computers, printers and office equipment		

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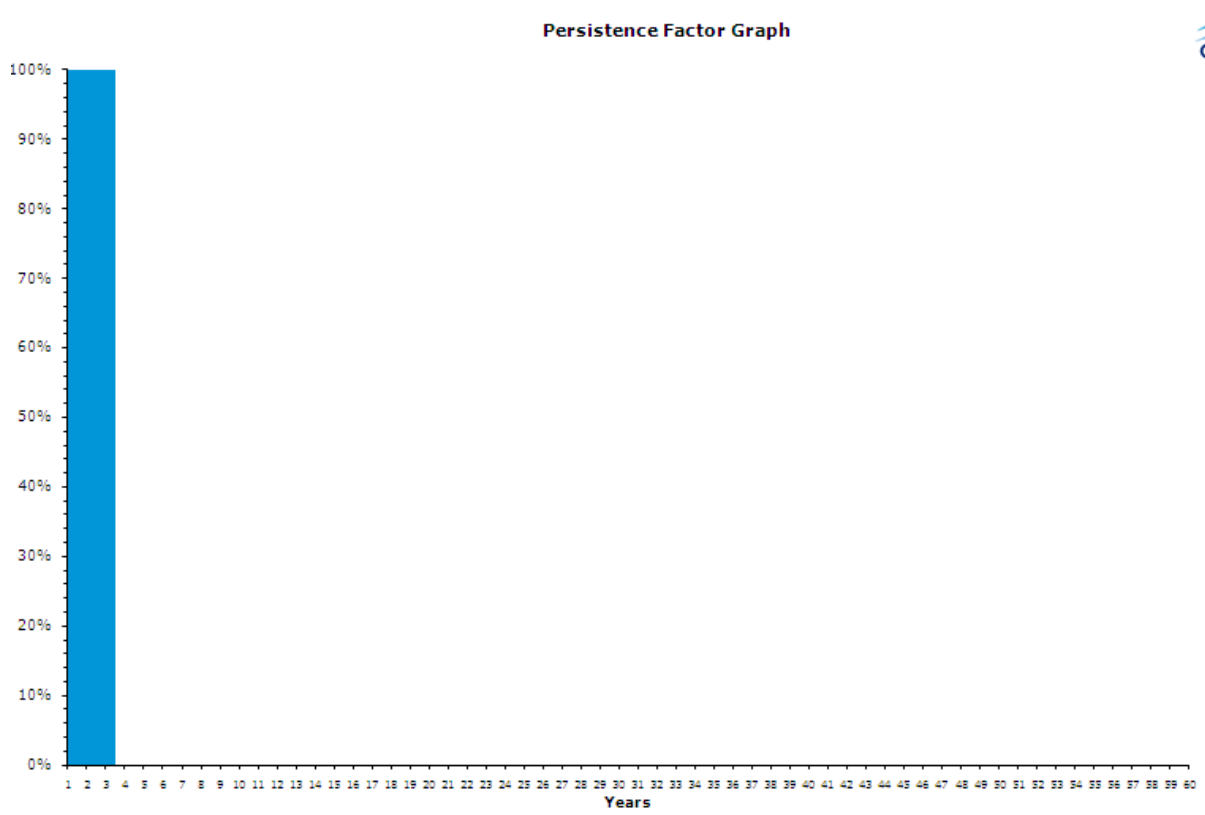
Salix Finance - ICT's projects in 10/11

10/11 Carbon Trust Persistence Factor for ICT & Office equipment



Source: The Carbon Trust

Salix Finance - ICT's projects in 10/11

10/11 Carbon Trust Persistence Factor for ICT & Office equipment

Energy type	p/kWh	Project Type	Technology - Work Type	Payback in years	PF	tCO_2 LT	£/tCO_2 LT	Compliancy
Gas	*2.25*	*Insulation - building fabric*	*Cavity wall insulation*	*4.50*	*30.00*	*1,633.92*	*18.36*	*Compliant*

Energy type	p/kWh	Project Type	Technology - Work Type	Payback in years	PF	tCO_2 LT	£/tCO_2 LT	Compliancy
Electricity	12.00	Computers & IT solutions	Virtualisation	1.36	3.00	90.00	100.00	Compliant
Electricity	10.00	Computers & IT solutions	CRT to flat screen LCD	1.63	3.00	90.00	100.00	Compliant
Electricity	8.00	Computers & IT solutions	Thin computers	2.04	3.00	90.00	100.00	Compliant
Electricity	10.00	Computers & IT solutions	Network PC power management	1.63	3.00	90.00	100.00	Compliant
Electricity	8.00	Office equipment	Office equipment improvements	2.04	3.00	90.00	100.00	Compliant

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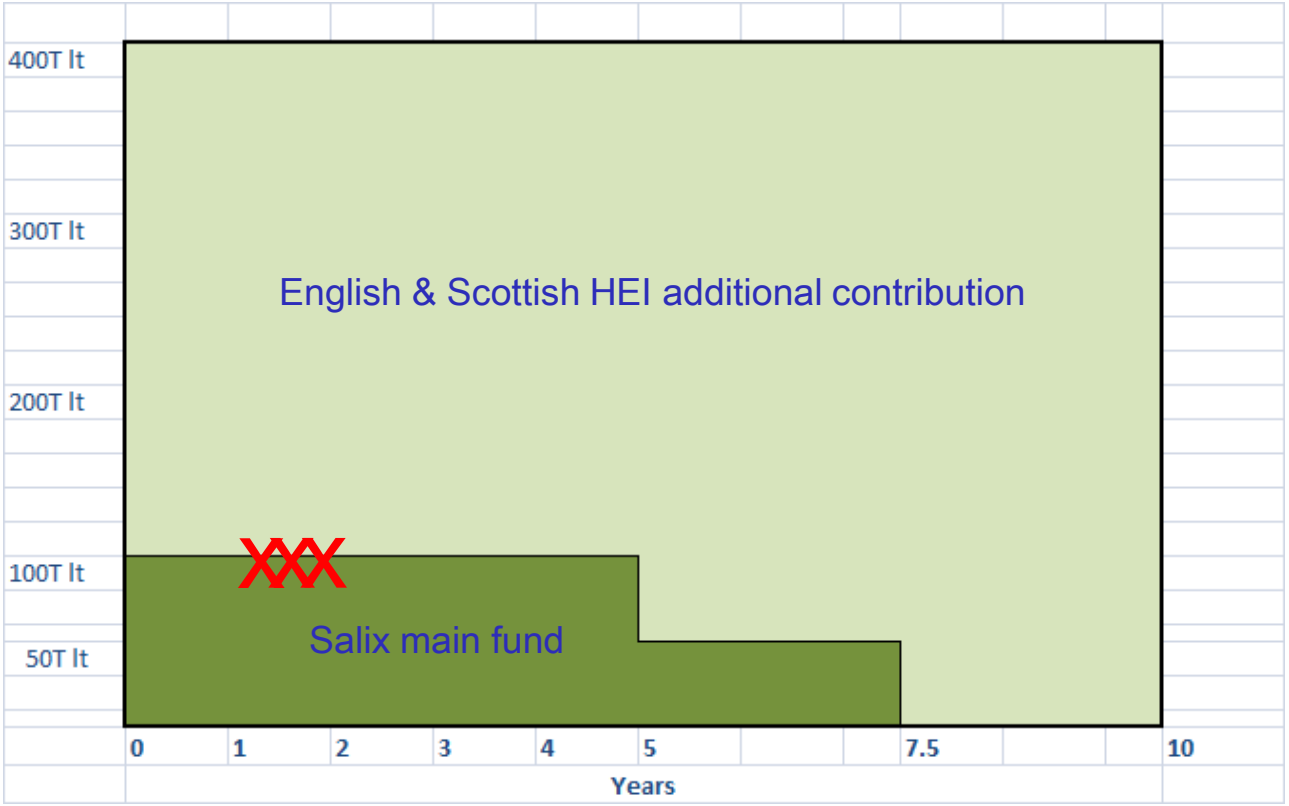
Salix Finance - ICT's projects in 10/11

10/11 Salix compliance rules using Carbon Trust Persistence Factors



Salix Finance - ICT's projects in 10/11

10/11 Carbon Trust Persistence Factor for ICT & Office equipment

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Energy type	p/kWh	Project Type	Technology - Work Type	Payback in years	PF	tCO_2 LT	£/tCO_2 LT	Compliancy
Electricity	12.00	Computers & IT solutions	Virtualisation	5.44	3.00	22.50	400.00	Additional contribution
Electricity	10.00	Computers & IT solutions	Thin computers	6.53	3.00	22.50	400.00	Additional contribution
Electricity	8.00	Computers & IT solutions	CRT to flat screen LCD	8.16	3.00	22.50	400.00	Additional contribution

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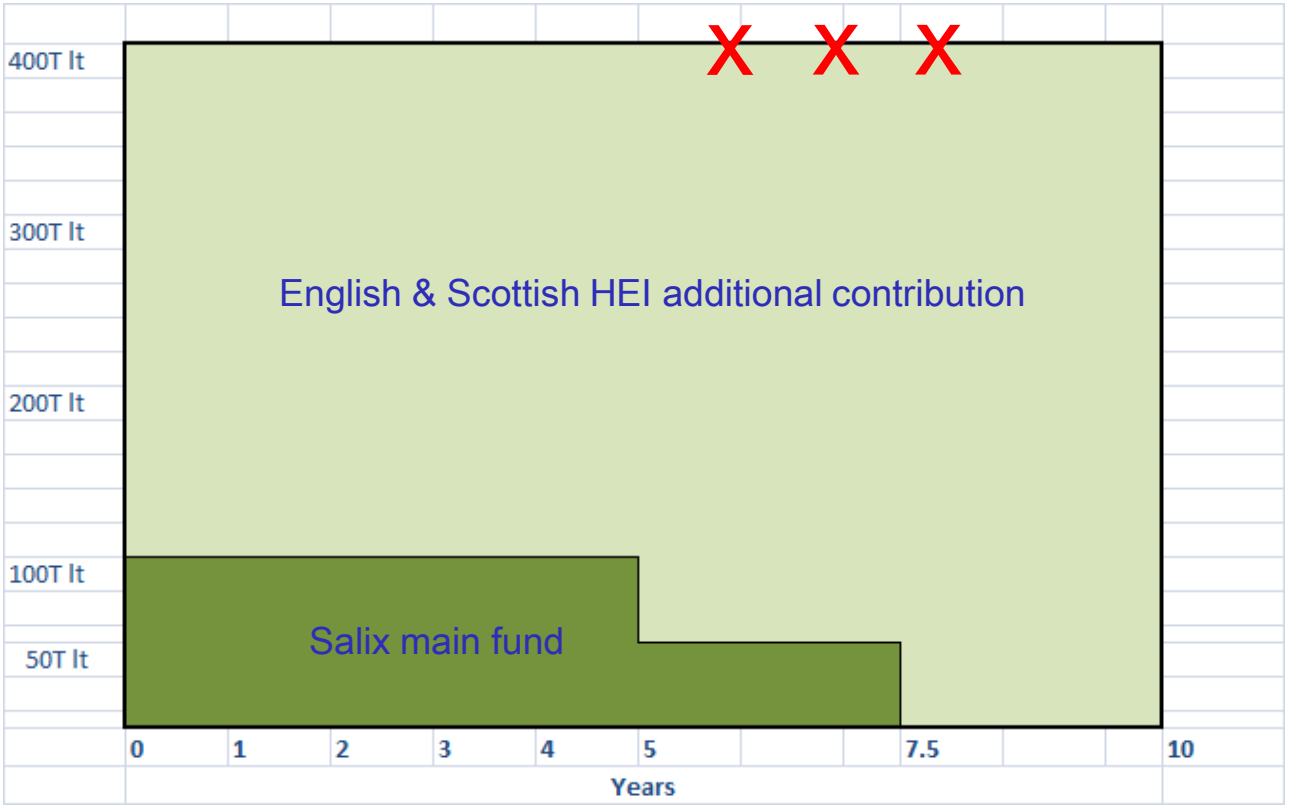
Salix Finance - ICT's projects in 10/11

10/11 Salix compliance rules using Carbon Trust Persistence Factors



Salix Finance - ICT's projects in 10/11

10/11 Recent work type additions with an ICT focus

Project Type	Work Type	New PF (Basic maintenance	Status/Comments
Computers & IT solutions	Network PC power management	3.00	
	CRT to flat screen LCD	3.00	Technology to be placed 'under watch'
	Virtualisation	3.00	Technology to be placed 'under watch'
	Thin computers	3.00	Technology to be placed 'under watch'
	Uninterruptible Power Supplies	18.00	Added in for V24
	Free Cooling for ICT	13.68	Added in for V24
	Evaporative cooling for ICT	13.68	Added in for V24

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Network PC
Power Management

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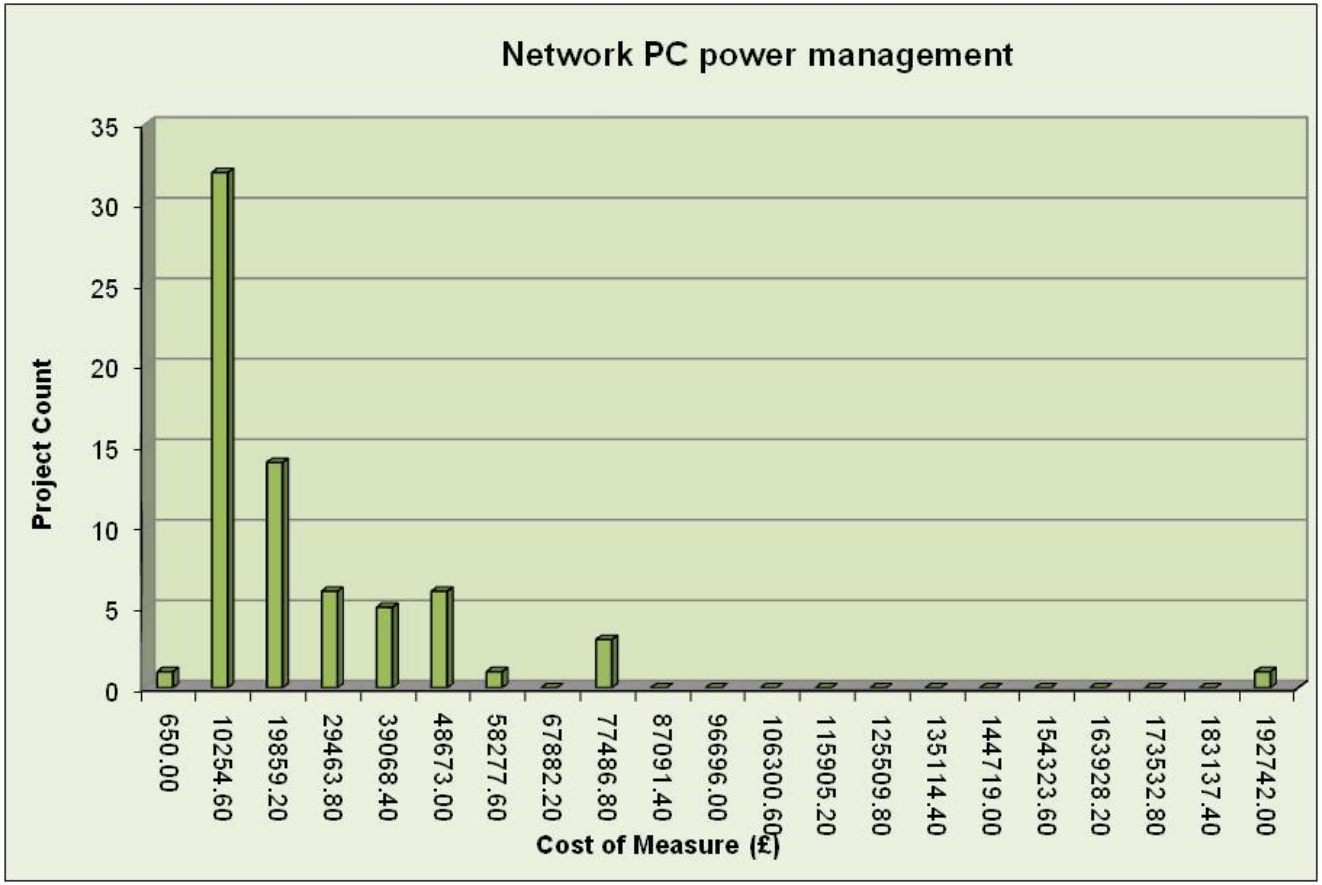
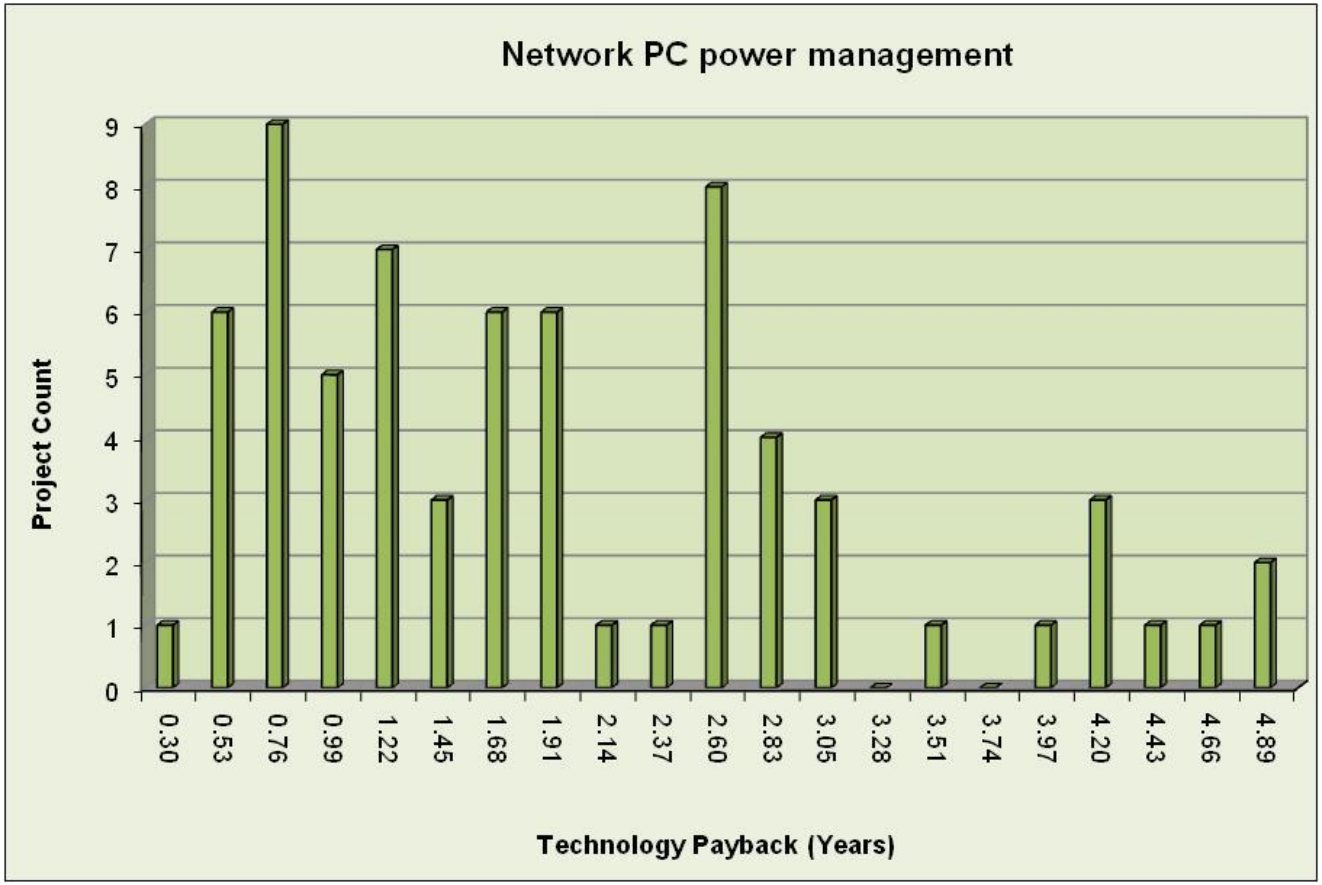
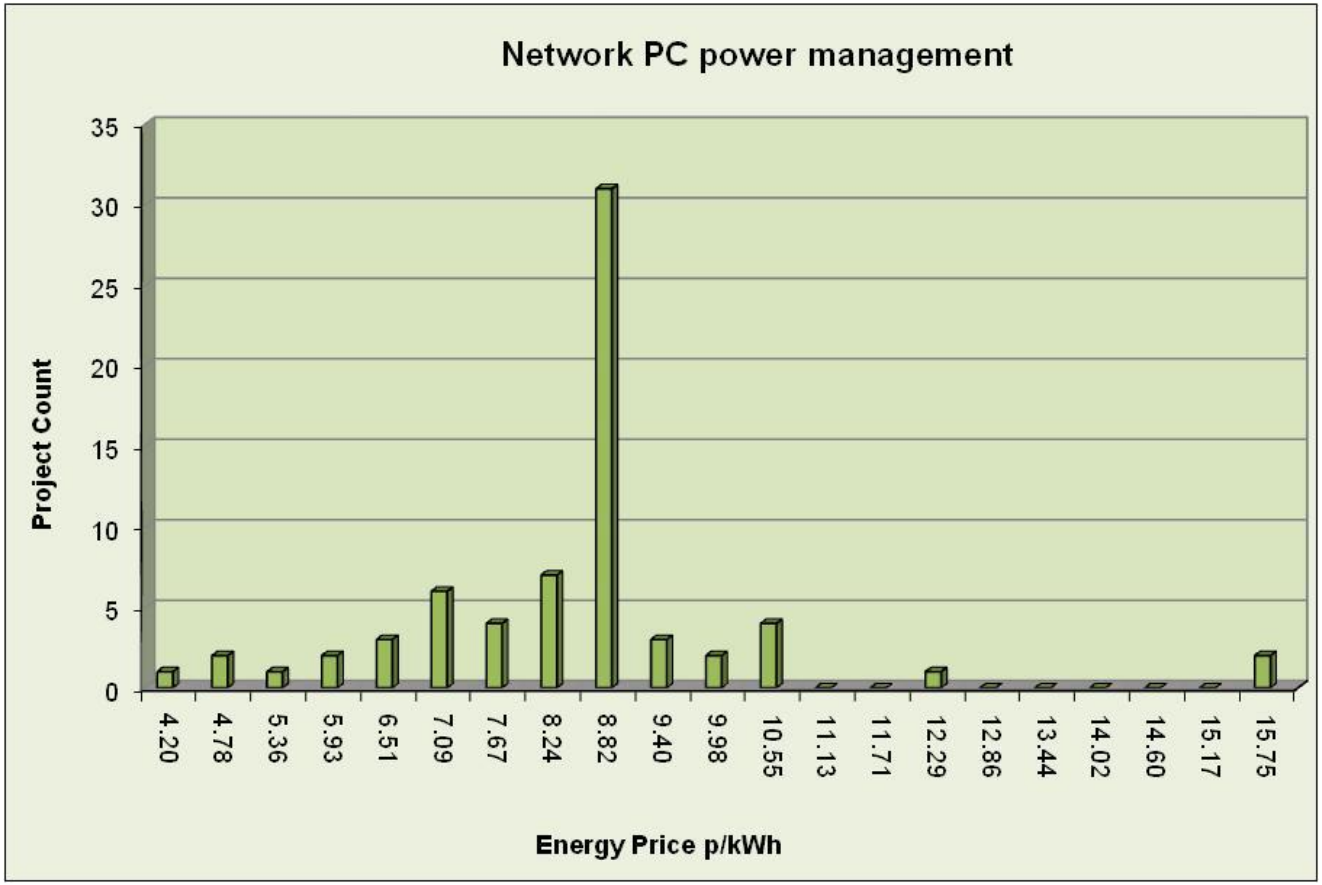
Salix Finance - Network PC management knowledge



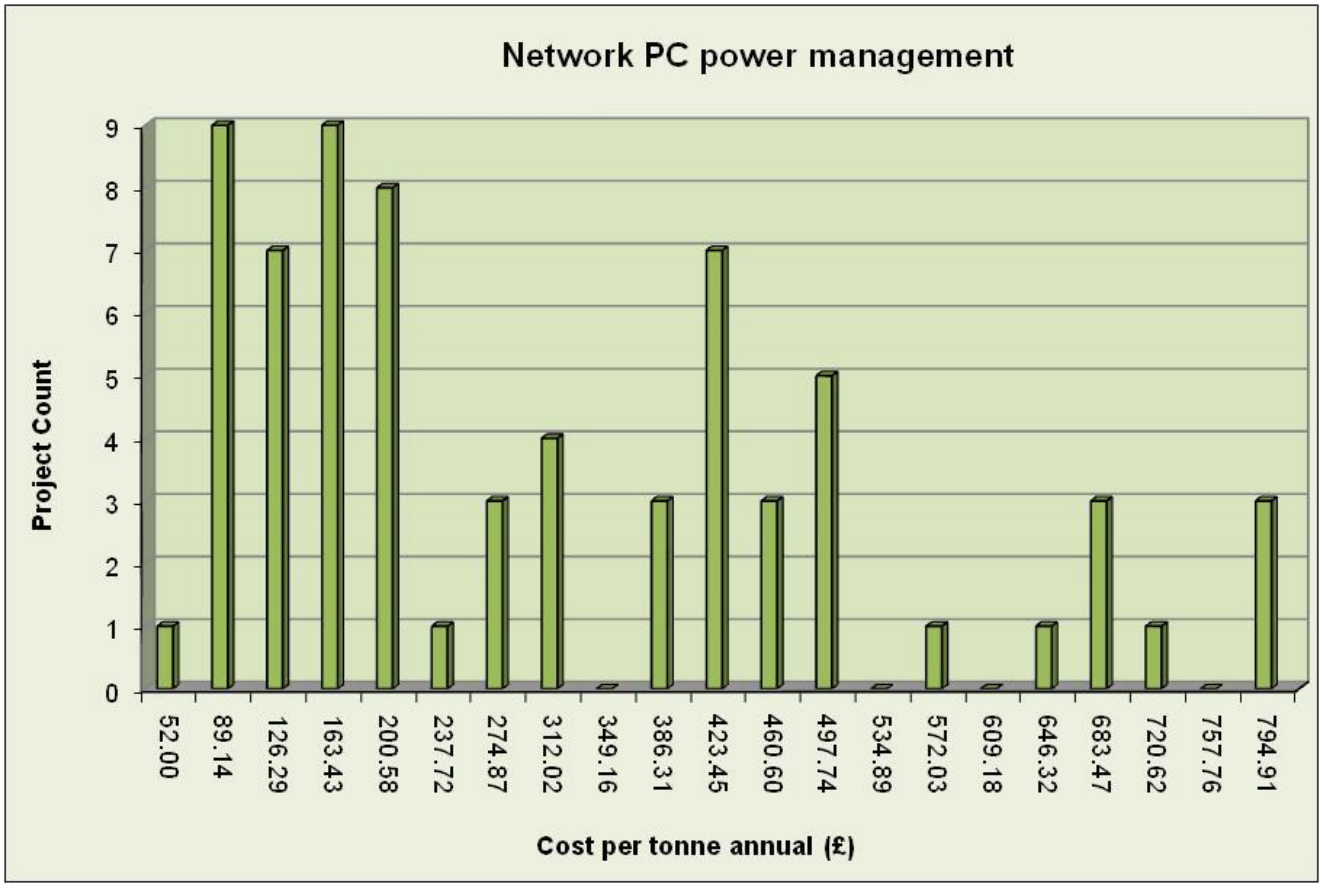
Salix Finance - Network PC management knowledge



Salix Finance - Network PC management knowledge



Salix Finance - Network PC management knowledge



Project knowledge – Remote Switching of Computers at University of Aberdeen

AFTER:

- Remote Switching installed
- Load reduced by 66% for each pc
- DIT still able to apply updates at night
- Project cost £68,558
- £37,000 saving / year
- 1.8 year payback
- 222.7 tCO_2 saved / year

BEFORE:

- 6,000 pc's potentially on overnight and at weekends
- £216,000 / year running costs

Project completion – Aug 2009

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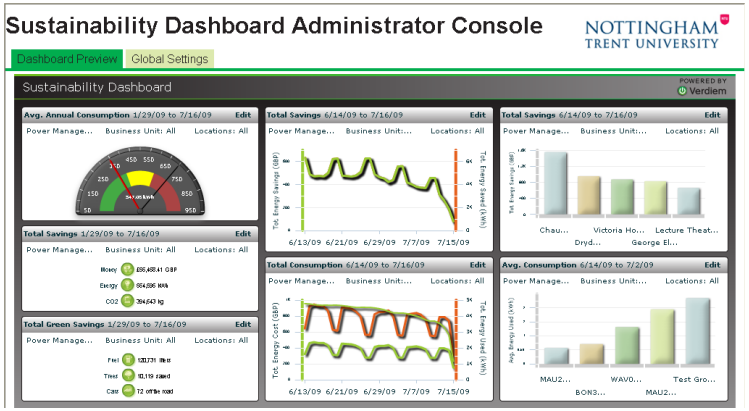
Project knowledge – PC Shutdown at Nottingham Trent University

BEFORE:

- Currently have 6500 PC's across the University
- Using in the region of 2,280,000kWh per annum



AFTER:

- Working with Verdiem to install monitoring and shut down software to ensure that all PC's are shut down when not in operation
- Initial calculations indicate annual energy savings of 1,200,000kWh
- Forecasted monetary savings of £90000/annum
- Forecasted Carbon Savings of 644 tonnes per annum
- Payback 2.73 years

Project completion – October 2009

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University of the West of England
BRISTOL

Project knowledge – PC Switch-Off at the University of West England

BEFORE:

- 3,500 staff and student PCs with no power management
- Annual electricity use 700,000 kWh

AFTER (anticipated savings):

- Verdiem Surveyor power management system to be installed, approximate cost £47k (including 5 years maintenance)
- Monitors the activity of all PCs and uses specified sleep and shut down settings to control computers and screens
- Projected annual electricity cut to under 500,000 kWh
- 112 tonnes of CO_2 saved per year
- £20,000 electricity costs saved per year
- 2.5 year payback based on predicted savings

Project roll out initiated September 2009

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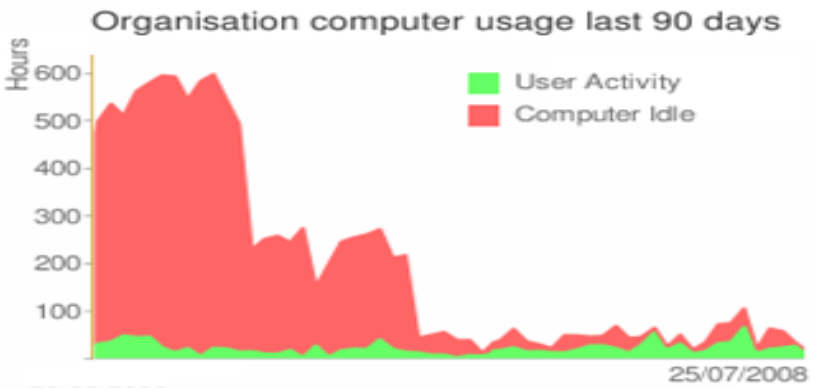
Project knowledge – Data Synergy POWERMAN at the University of Sussex

BEFORE:

- 3,500 PCs, many in general areas
- Poor control over user behaviours
- Non-standard hours
- Difficulty in campaigning with a transient population
- Need for IT to maintain control regarding software updates etc
- Lack of data
- "Typical" wastage shown below:



AFTER:

- Fully programmable with "intelligent" parameters and data management capabilities
- Fully compatible with OS
- Cost: £14,863 for 3,500 PCs
- £29,726 saving / year projected
- Payback 0.5 years
- 203 tCO_2 saved / year

Microsoft Excel

View Insert Format Tools Data

08/07/2008

A	B	C
	TotalConsumption	ActiveCons
11/06/2008	33.3	17.475
12/06/2008	33.3	14.9625
13/06/2008	34.8375	17.1375
14/06/2008	21.6	0.0375
15/06/2008	19.5	0
16/06/2008	36.75	15
17/06/2008	40.9125	16.3875
18/06/2008	41.025	18.3
19/06/2008	33.1125	15.375
20/06/2008	32.1375	16.35

Project completion date – June 2010

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Project knowledge - Data Synergy POWERMAN at the University of Sussex

Supporting comments

- Rapid management of power features from a central location
- Configure policies per user, per group and per computer
- Separate policy for when nobody is logged on
- Options to sleep, hibernate, shutdown or logout idle computers
- Schedule wake, sleep, shutdown and hibernate to match user patterns and system updates
- Allow users to wake their own PC for remote access with a simple hyperlink
- Allow approved users to override or opt-out of management policy
- Works with Windows® power management to ensure no accidental loss of user data
- Requires no user intervention or site visit to be effective and is practically invisible to users
- Automatically reports the usage profile of each PC in the organisation

Client - University of Sussex
Tel - 01273 678262
Client contact - Pat Pica
Email - p.pica@sussex.ac.uk

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Salix Finance - ICT's projects in 10/11

10/11 Network PC power management experience

Client
Aberdeen University
Bolton University
Cranfield University
Croydon Council
Leeds Trinity & All Saints College
Leicestershire County Council
Manchester Metropolitan University
Norwich City Council
Nottingham Trent University
Oxford Brookes University
Sussex University
University of Bedfordshire
University of Leicester
University of Lincoln
University of Nottingham
University of St Andrews
University of West England
Worcester University of

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Salix Finance - ICT's projects in 10/11

10/11 Network PC power management issues

- Careful consideration not to over count savings
- Are the savings being projected by SW accurate / relevant to your kit
- What to include in terms of up keep
- Proprietary packages over that of in-house solutions
- User engagement / satisfaction

Salix clients have plenty of experience, how best should this knowledge this be pooled & shared?

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Evaporative
& Free Cooling

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Salix Finance - ICT's projects in 10/11

10/11 Evaporative & Free Cooling – client experience

Client
Aberdeen University
Birmingham University
Blaenau Gwent
Bournemouth University
Bristol City Council
Buckinghamshire County Council
DEFRA
East Anglia University
Edinburgh University
Essex University
Exeter University
Glasgow University
Keele University
London Borough of Bromley

Manchester University
Napier University
Norwich City Council
Oxford Brookes University
Portsmouth University
The Open University
Torfaen Council
University College London
University of Nottingham
University of St Andrews
University of West England
Warwick University
Worcester University of
York University

Not all for ICT applications + some air com improvements

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Project knowledge – Chiller With Free Cooling at University of Aberdeen

AFTER:

- 2 chillers changed out for units with free cooling
- Free cooling capacity in each of the new machines is 50 kW at an ambient temperature of 5 deg C
- Project cost £92,151
- £18,000 saving / year projected
- 88.3 TCO_2 saving / year projected
- Payback 4.9 years

BEFORE:

- 3 x 120kW Cooling Chillers, with no free cooling facility
- £54,000 / year running costs

Project completion – Sep 2009

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Project knowledge – Data Centre Free Cooling by Bristol City Council

Salix funded free cooling option at The Council House:

- £120,840 investment (inc. manage. fee);
- Free cooling loop cools via the moat, with efficient dry cooler backup, EC fans, full BMS control & 'hot aisle containment';
- Cooling load reduced by 77% to 7kW;
- £23,992 saving
- Payback 5 years
- 112 tCO_2 saving

Within budget cooling option

- DX chiller plant – cheap but inefficient;
- Running costs £31,000/year;
- No free cooling option.

Project commissioned - June 2009

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Project knowledge - Data Centre Free Cooling by Bristol City Council

02

INNOVATION IN THE MICRO DATA CENTRE

WINNER

Bristol City Council - The 'Council House' modular data centre

Award Winners!

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Project knowledge – Server Room Eco Cooling by Warwickshire County Council

AFTER:

- 2 Eco Cooler Units.
- Total Cost £18,966
- Electricity use reduced by 58,824 kWh/year
- £5,000 saving / year @ 8.5p/unit.
- Payback 3.8 years
- Saving 30.8 tonnes CO_2 / year

BEFORE:

- 3 Air Conditioning Units cooling and re-circulating server room air.
- £5,450/ year running costs

Project completion – October 2008

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Servers

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Project knowledge – High Performance Computing at Dept of Physics and Astronomy

University of Leicester

AFTER:

- Servers-110 quad core processor in 55 servers.
- Power requirement of servers 15 kW
- Total power for rooms 35kW)
- Project cost £83,753 .
- £77,231.96 saving/year projected.
- 560.78 tonnes CO2/year saved.
- Payback 12 months.

BEFORE: (HPC servers + auxiliary systems)

- Servers - 436 single core processor in 114 servers.
- Power requirement of servers 65 kW.(Total power for rooms 153kW PUE 2.3)
- 1,336,608 kWh £100,139/yr running costs.

Client contact – Chrispal Anand Tel – 0116 252 2308 Email – cpa4@le.ac.uk

Project completion – June 2009

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Uninterruptible Power Supplies & HV transformers

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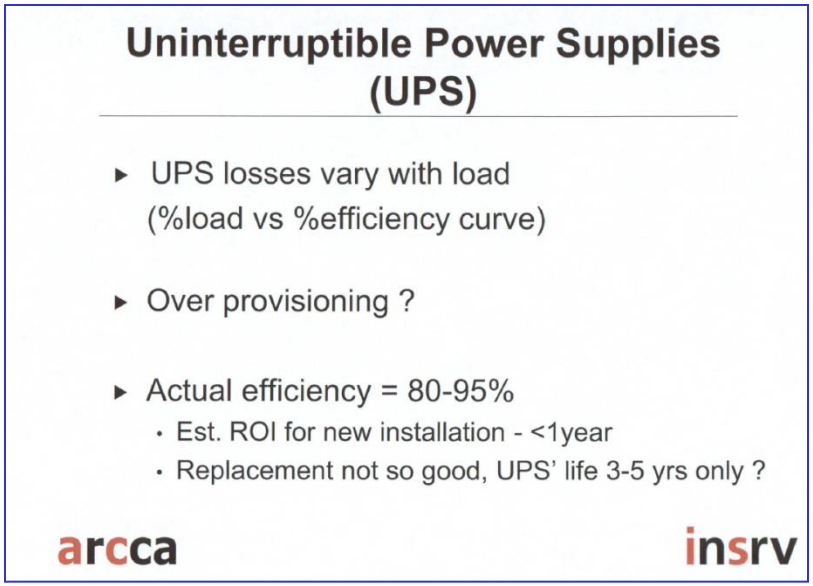
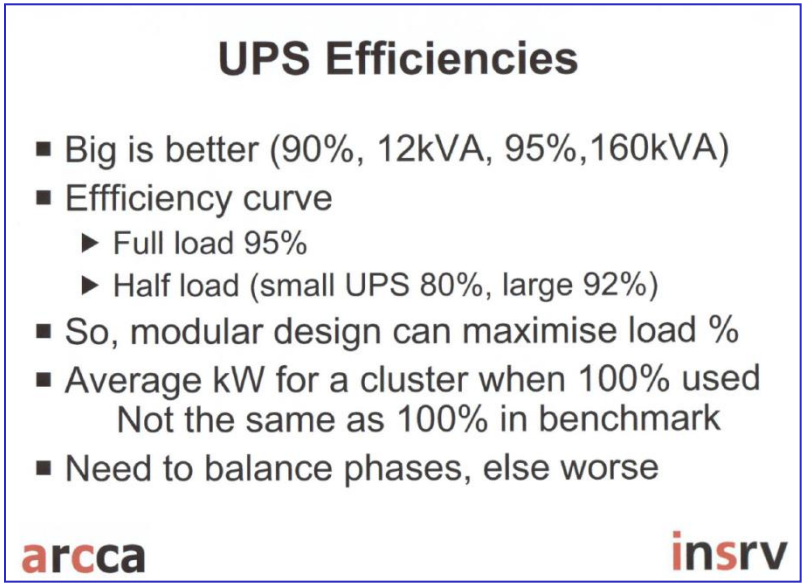
Salix Finance - ICT's projects in 10/11

10/11 New work types with an ICT focus – UPS

Material from recent HEEPI event at Cardiff University – 7th Sept10





With kind thanks to Hugh Beedie,
Prof Martyn Guest & Dr Christine Kitchen

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Project knowledge – UPS upgrade for main servers – IT Department, Cranfield University

AFTER:

- Riello 160 kVA UPS installed by Keysource
- 92% efficient using IGBT technology
- up to 98% in “Eco” (line interactive) mode
- With partial load 86% efficiency so far
- Project cost £71k
- £28k saving / year projected
- 95 tonnes CO2/year saved
- Payback 2.6 years

BEFORE:

- Chloride UPS, 93 kW load 72% efficient
- With partial load 50% efficient
- £124k /yr running costs

Project completion – June 2010

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Project knowledge – UPS upgrade for main servers – IT Department, Cranfield University

Supporting comments

- Energy calculations based on UPS running 8,760 hours per year.
- Electricity price – 15.75 p/kWhr
- Supplier – Keysource Ltd www.keysource.co.uk
- Model No – Riello Multi Dialog 160 kVA

Client - ***Cranfield University*** Client contact - **Gareth Ellis**
Tel - 01234 750111 Email - r.g.ellis@cranfield.ac.uk

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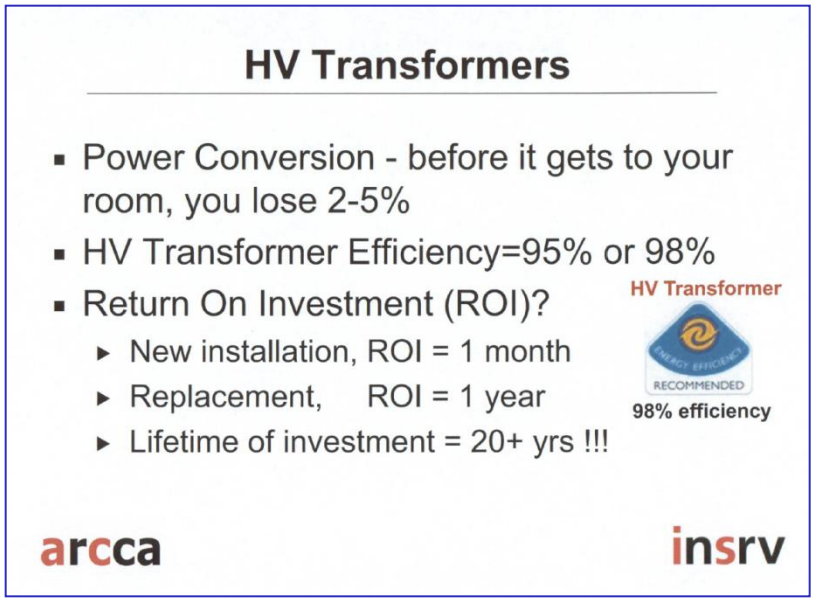
Salix Finance - ICT's projects in 10/11

10/11 New work types with an ICT focus – HV transformers

Material from recent HEEPI event at Cardiff University – 7th Sept10



With kind thanks to Hugh Beedie,
Prof Martyn Guest & Dr Christine Kitchen

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Project knowledge – 500kVA Transformer replacement by Keele University (Lindsay Hall Sub Station)

BEFORE:

- 1962 transformer to be replaced
- No load loss (iron) **1300W** / Load Loss (cu) **6860W**
- Annual energy throughput 850,000kWh
- £85,000/year running costs
- Straight replacement @ circa £10K

AFTER:

- New low loss transformer + cables with 30 year life and costing £20,811
- No load loss (iron) **560W** / Load Loss (cu) **5000W**
- 7.5% Voltage optimisation & 6600KW efficiency savings
- Annual consumption reduced to 780,000kWh
- £ 6,375 annual savings giving a 3.3 year payback
- 35T CO_2 annual savings.

Project completion date - August 2009

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Project knowledge – 500kVA Transformer replacement by Keele University (Lindsay Hall Sub Station)

Supporting comments

- Original transformer was installed in 1962 and had typically losses of those manufactured at the time
- Secondary voltage levels were over 245 volts even on the minimum tap setting
- Replacing the transformer with a low loss high efficiency one with a reduced secondary level of **225 volts** approx, has given good transformer efficiency savings as well as those due to voltage reduction

In addition

- We have a new transformer including new oil with a projected 30 year life
- A fully rated solution that is 'future proofed' with variable output voltages, by means of an off load 6 position HV tap change, **+7.5%, +5%, +2.5%, 0, -2.5%, -5%.**
- No additional space was required as it is a direct replacement
- Full installation and backup service provided by established HV contractor:
  Midlands Power Networks Ltd

Client - Keele University
Tel - 01782 733467
Client contact - Martyn Wilde
Email - m.j.wilde@kfm.keele.ac.uk

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Salix Finance - ICT's projects in 10/11

10/11 New work types with an ICT focus – general issues & opportunities

General issues

- Refresh rates, replacement & economic life
- Salix compliance rules
- How to ensure replaced equipment is retired & energy/carbon is saved
- How to protect the 'freed up' savings

Opportunities

- Purchase equipment above and beyond current practice e.g. energy saving recommended *(Salix funding for additional part)*
- IT department are aware of energy budgets / sub metering
- Sharing knowledge (expanded Salix website area for clients)

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Salix Finance - ICT's projects in 10/11

10/11 New work types with an ICT focus

- In addition to Network PC power management & cooling, it is considered that future opportunities may exist for:
  - Energy Efficient Server Replacement
  - Energy Efficient File Storage Replacement
  - Additional cost to upgrade new LCD monitors to LED
  - Incoming transformers to be replaced or have improved specification to become *'low loss'* or *'super low loss'* solutions
  - *What else?*

Should clients be interested in any of the above options, the technology can be added to the Salix list in the normal way

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Close and thank you!

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