LESSONS

Presented by
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ICEBO Conference
Manchester Hilton
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Introduction

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• There is high confidence that human activity is warming the climate – IPCC 4AR

• We need to limit stabilise carbon dioxide in atmosphere to 450 ppm.

• Buildings account for 40% of carbon emissions.

• Massive gaps between building design and actual building performance.

• Key step – Base new designs on lessons learnt from previous building designs.

Actual vs Forecast energy use

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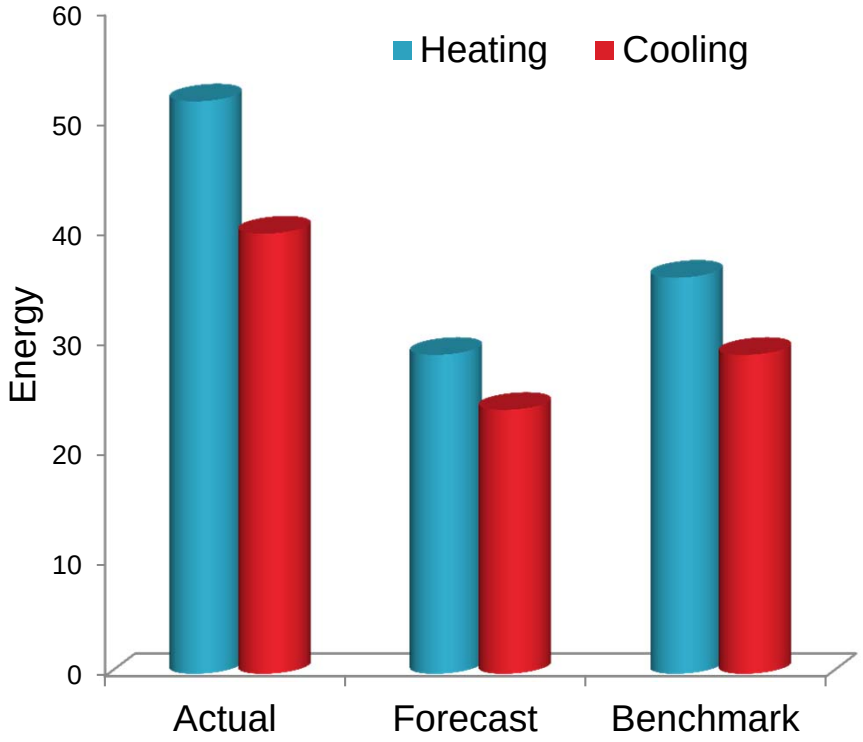

EPC vs. DEC!!

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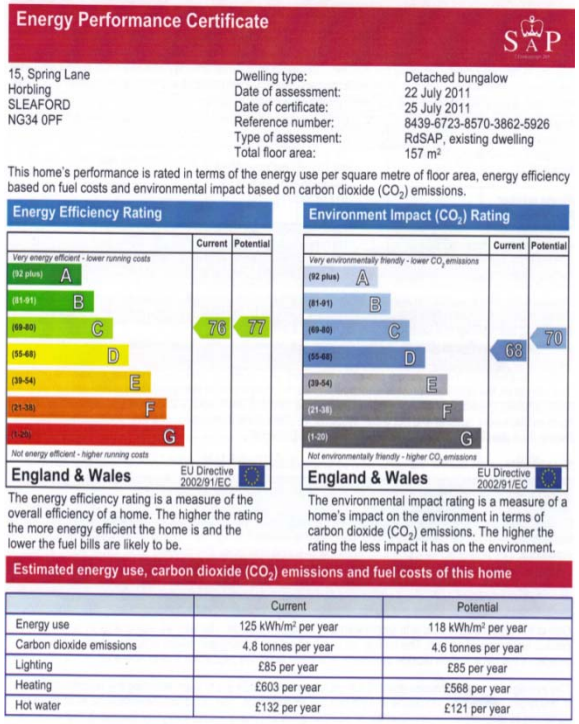


Energy Performance Certificate

SAP

15, Spring Lane
Horbling
SLEAFORD
NG34 0PF

Dwelling type:	Detached bungalow
Date of assessment:	22 July 2011
Date of certificate:	25 July 2011
Reference number:	8439-6723-8570-3862-5926
Type of assessment:	RdSAP, existing dwelling
Total floor area:	157 m²

This home's performance is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO_2) emissions.

Energy Efficiency Rating

	Current	Potential
Very energy efficient - lower running costs		
(92 plus) A		
(81-91) B		
(69-80) C	76	77
(55-68) D		
(39-54) E		
(21-38) F		
(1-20) G		
Not energy efficient - higher running costs		
England & Wales	EU Directive 2002/91/EC	

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

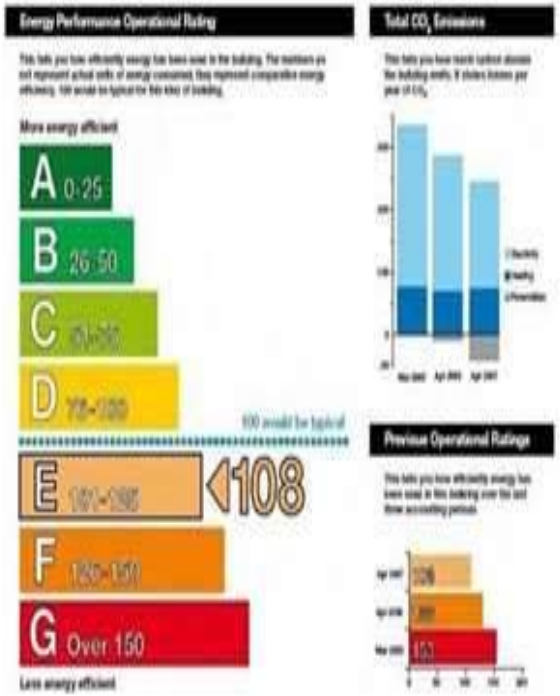
Environment Impact (CO_2) Rating

	Current	Potential
Very environmentally friendly - lower CO_2 emissions		
(92 plus) A		
(81-91) B		
(69-80) C		
(55-68) D	68	70
(39-54) E		
(21-38) F		
(1-20) G		
Not environmentally friendly - higher CO_2 emissions		
England & Wales	EU Directive 2002/91/EC	

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

Estimated energy use, carbon dioxide (CO_2) emissions and fuel costs of this home

	Current	Potential
Energy use	125 kWh/m² per year	118 kWh/m² per year
Carbon dioxide emissions	4.8 tonnes per year	4.6 tonnes per year
Lighting	£85 per year	£85 per year
Heating	£603 per year	£568 per year
Hot water	£132 per year	£121 per year



LESSONS

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- LESSONS – New Web based design tool providing knowledge gained from previous designs.
- Closing the gap between forecast and actual building performance.
- Supported by industry.
- Key stakeholders – Architects, Engineers, Manufacturers and Group organisations

Aims of LESSONS

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- Design tool containing quantitative, explicit knowledge and qualitative, tacit knowledge.
- Data presented in simple accessible manner.
- Applicable to new build and retrofit/refurbishment.
- Initially for housing and school design.
- Offices, retail, courts etc....future additions
- Also addition of other environmental features..water

Objectives of LESSONS

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• Existing tools provide means of calculation and have no lessons. Designers have to independently gather information.

• Make case studies central to the DB.

• Database providing previous design information and ‘rules of thumb’ guidance.

• Early stage design information available for novice to expert level.

• Integrate DB with established dynamic simulation modelling tool. IES VE

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Methodology

- Surveys, questionnaires and workshops.
- 100 contemporary case studies identified.
- Case study codification and content analysis.
- Inform User interface

Welcome

LESSONS

Home Page

Login - Register

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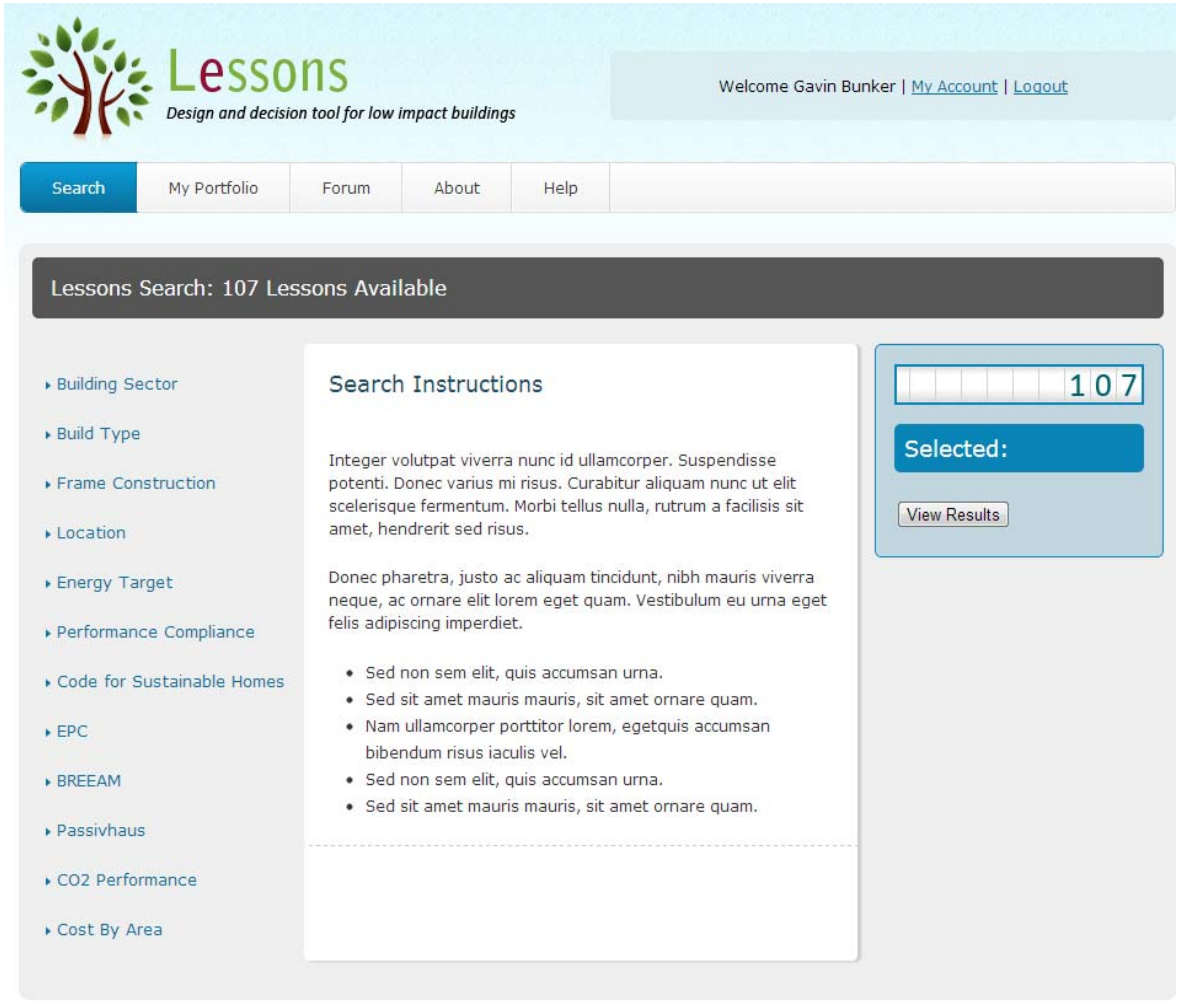
Building	Location	Energy Target	Assessment	Performance CO2
Build Type	Country	Passivhaus	All	All
Sector	Region	Blg Regs	LEED	High to Low
Construction	City	CfSH	BREEAM	Low to High
	Rural			Specified



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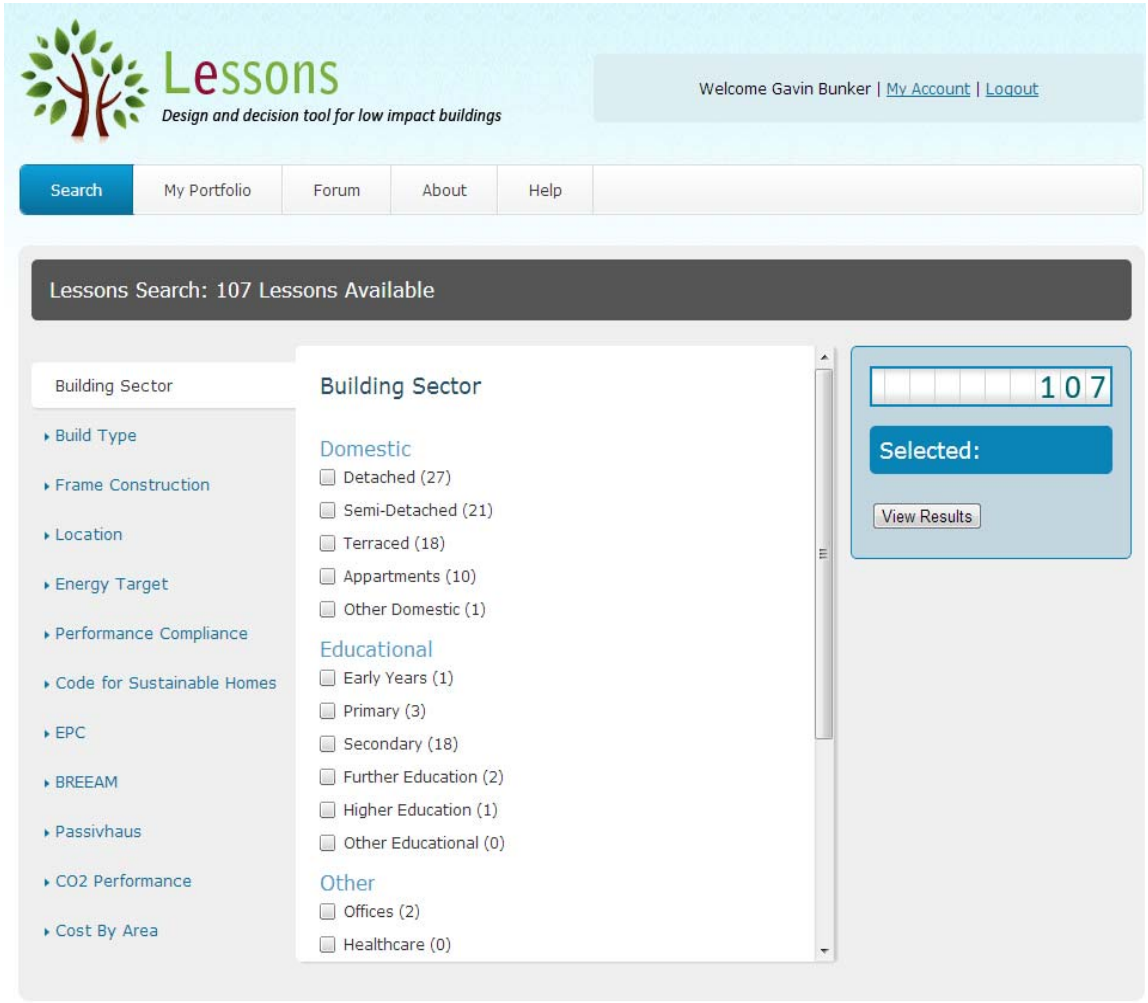

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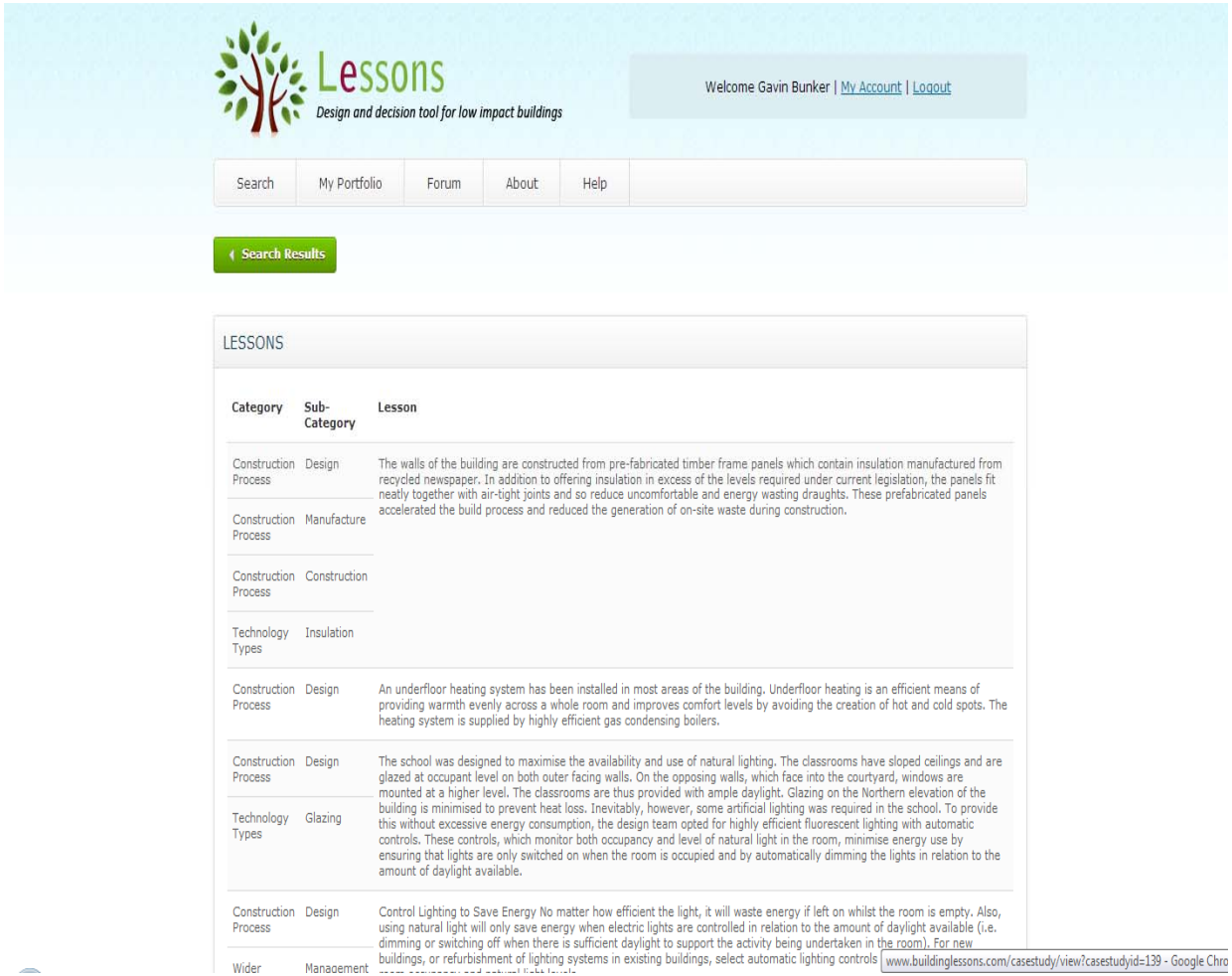

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Currently No Image Available

Windygoul Primary School

Average Rating

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Votes: 0

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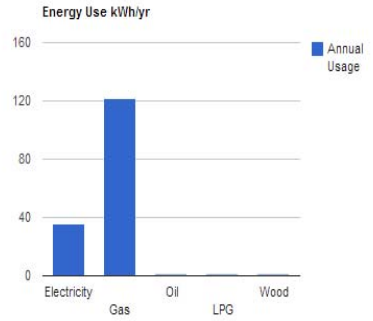
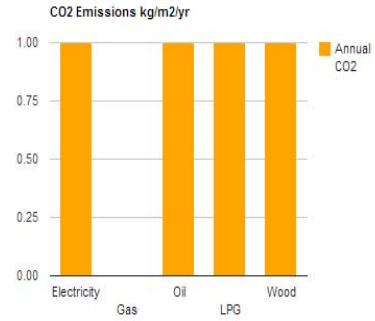
CHARTS





GENERAL

Energy codification education/domestic sectors combined

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Theme	-ve outcome	+ve outcome	Total
Fabric performance	7	123	130
Passive technology	7	50	57
Technology	2	29	31
Renewable energy	1	12	13
Management	7	6	13
Off site construction	0	9	9

Energy Outcomes in the Domestic Sector

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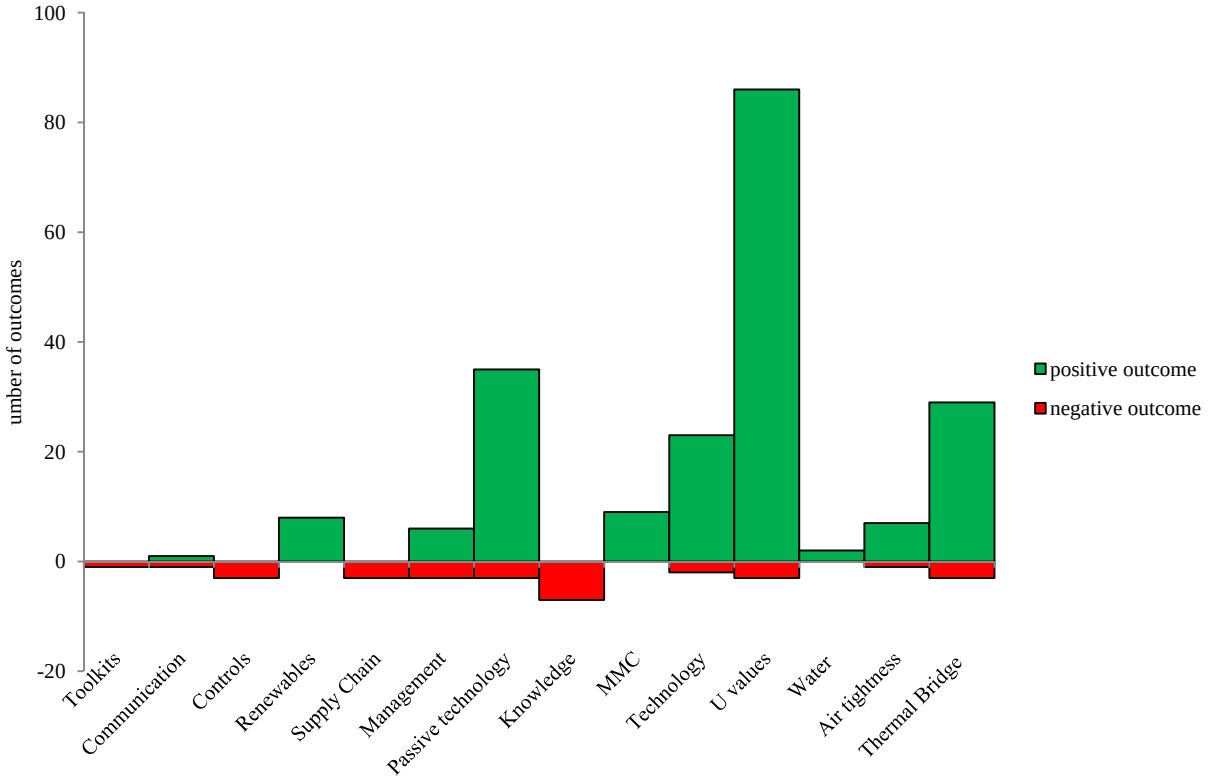

Energy Outcomes in the Education Sector

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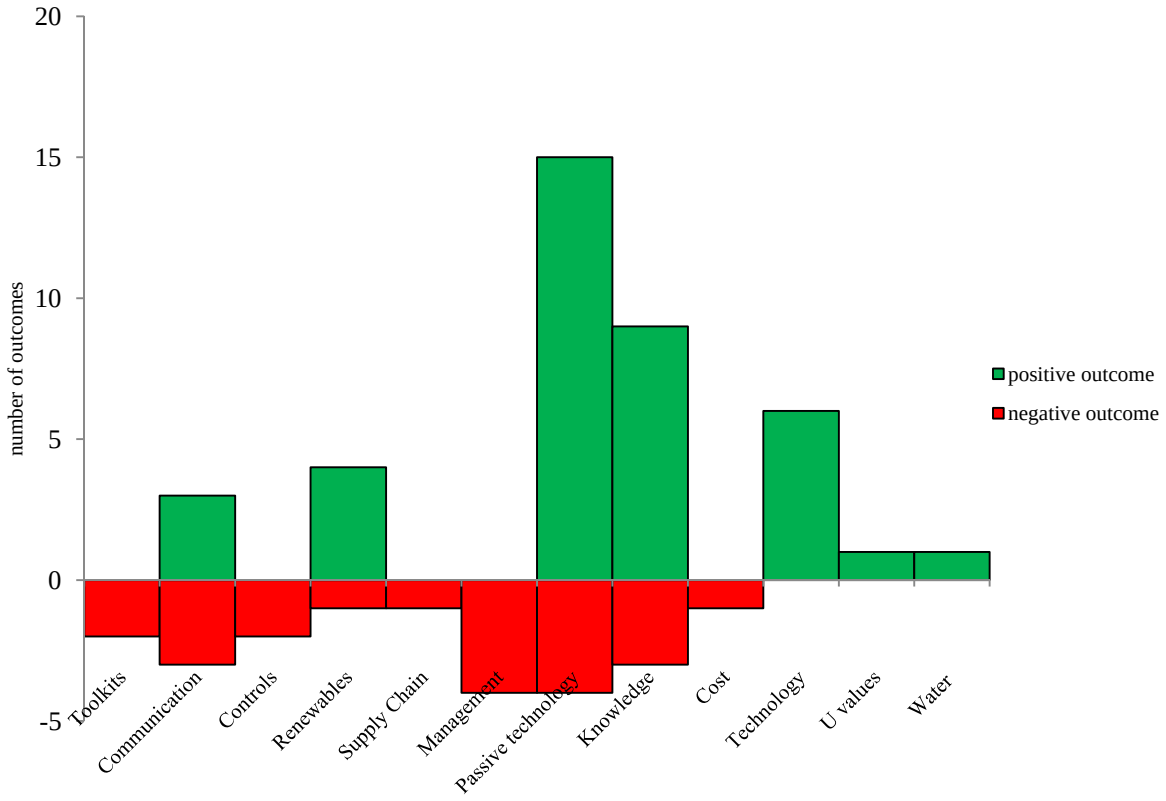

Example – Elm Tree Mews York (JRF)

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- New Build Housing, >AD Part L 1B 2006, CfSH Level 4

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Insights

- Thermal bridging leads to heat loss.

- Elm Tree Mews, TB responsible for 25% whole heat loss.

- Lessons
  - Energy failure due to incorrect U- values
  - Tacit knowledge gap, reliance on SAP standard details
  - Tacit knowledge gap, poor design detailing

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Insights

- Air tightness – cause of heat loss up to 50%!

- Elm Tree Mews, High levels of infiltration

- Lessons
  - Energy failure due to difficult junction details
  - Target not made explicit in design brief
  - Tacit knowledge gap, poor design detailing

Example – Cottesmore Road Leicester (EMHA)

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• Refurbishment, Retrofit for the future, improved infiltration and insulation

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Insights

- Loss of floor area due to new internal insulation

- Lessons
  - Pod installation in attic to address floor area loss
  - MMC solution
  - Requires good communication between contractor and client

Example – Meden Vale Notts (Nottingham University)

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- Whole house retrofit solution

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Insights

- Thermal bridging reduced
- Passive solar strategy

- Lessons
  - Specialist knowledge sought for correct detailing
  - Openings must be the same on all properties
  - Prevents problems with different planning permissions
  - Helps to make project repeatable

Example – Northampton Academy

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- New build secondary school

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Insights

- Night time cooling
- Estimate unregulated loads
- Allow for growth in IT loads

- Lessons
  - Energy consumption through night cooling seek expert knowledge for design, better use of BMS
  - Explain impact of unregulated loads to client – No shocks /manage expectation
  - Future proof design by allowing for growth in IT loads

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Next Steps

- Beta test tool November 2012.
- Addition of new building sectors - commercial property.
- Populate tool with international case studies and lessons.
- Marketing of tool.

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Conclusions

• The 6 themes that emerged from this study where energy performance can be improved are:

• Fabric performance,

• Use of passive technology,

• Technology (such as MVHR),

• Renewable energy,

• Management, and

• Off site construction techniques.

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Conclusions

• The 3 interventions that will have the biggest impact on energy reduction are:

• The provision of insulation,

• The reduction in thermal bridging, and

• The use of passive technology.

• Throughout the study the importance of attention to detail in the initial design stage has frequently been mentioned. Failure to do so has lead to some apparently fairly trivial decisions and design changes resulting in large impacts on the energy performance of buildings.

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Try LESSONS
www.buildinglessons.com

Thank you

Acknowledgements

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Collaborators

Technology Strategy Board
Driving Innovation

ies

PICK EVERARD

VANGUARD HOMES LTD

Case study data fields domestic sector

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Ref	Lesson	Building	Location	Energy target	Environmental assessment	Performance
P001	Underestimation of timber fraction resulted in significant heat loss – 23%	Terraced Timber frame	York	> AD1B 2006	CfSH 4	Low carbon 20 kg/m2/yr

Lesson classification domestic sector

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Approach	Process	Technology	Wider subject area
Aspirational	Design	Natural vent	**Management**
Regulation	Manufacture	**Thermal mass**	Infrastructure
Best practice	Construction	GSHP	Transport
Innovation	Commissioning	**PV**	Waste
Pioneering	Refurbishment	Solar thermal	**Water**
Other	**New build**	Wind	**Biodiversity**
	Other	**Insulation**	Other
		Glazing	
		Other	