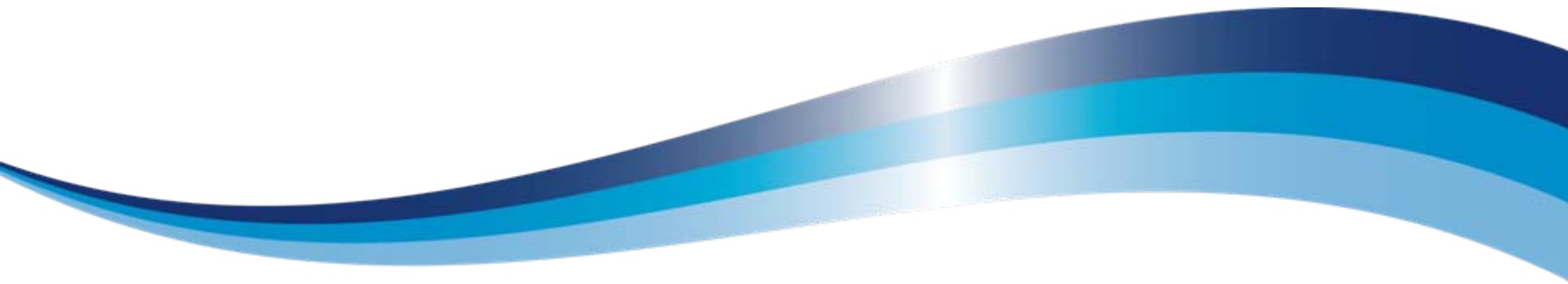


Addressing the carbon impact of the built environment

John Stocks
Manager - Scotland

November 2008



The Carbon Trust is making business sense of climate change



Our mission is to accelerate the move to a low carbon economy by developing commercial low carbon technologies and helping organisations reduce their carbon emissions

We do this by being a catalyst for low carbon enterprise:



Insights

Explaining the low-carbon economy



Solutions

Delivering carbon savings for organisations



Innovations

Developing new low-carbon technologies



Enterprises

Creating new low-carbon businesses



Investments

Financing low-carbon businesses

The carbon impact of an operational site



- Administrative office, educational establishment, manufacturing plant, hospital, retail, hotel, leisure or transport node
 - Energy for heat, light and cool
 - Energy to power plant & equipment
 - Staff travel and transport
 - Waste streams
 - Staff commuting
 - Client travel
 - Embedded carbon in buildings, plant & machinery
 - Embedded carbon and transport of goods and raw materials

Results

Element	Tonnes of CO2e		Trend
	2006/07	2007/08	
Energy - Building	77,799	75,609	-2.8%
Energy - Infrastructure	12,180	12,487	+2.5%
Waste - Office	2,794	2,794	0%
Waste - Skip	5,281	5,187	-1.8%
Transport – Booked travel	105	85	-19.1%
Transport - Staff mileage	3,313	3,489	+5.3%
Transport – Fleet fuel	13,286	13,474	+1.4%
Total	114,757	113,125	-1.4%

Towards a low carbon future

- Low carbon design principles



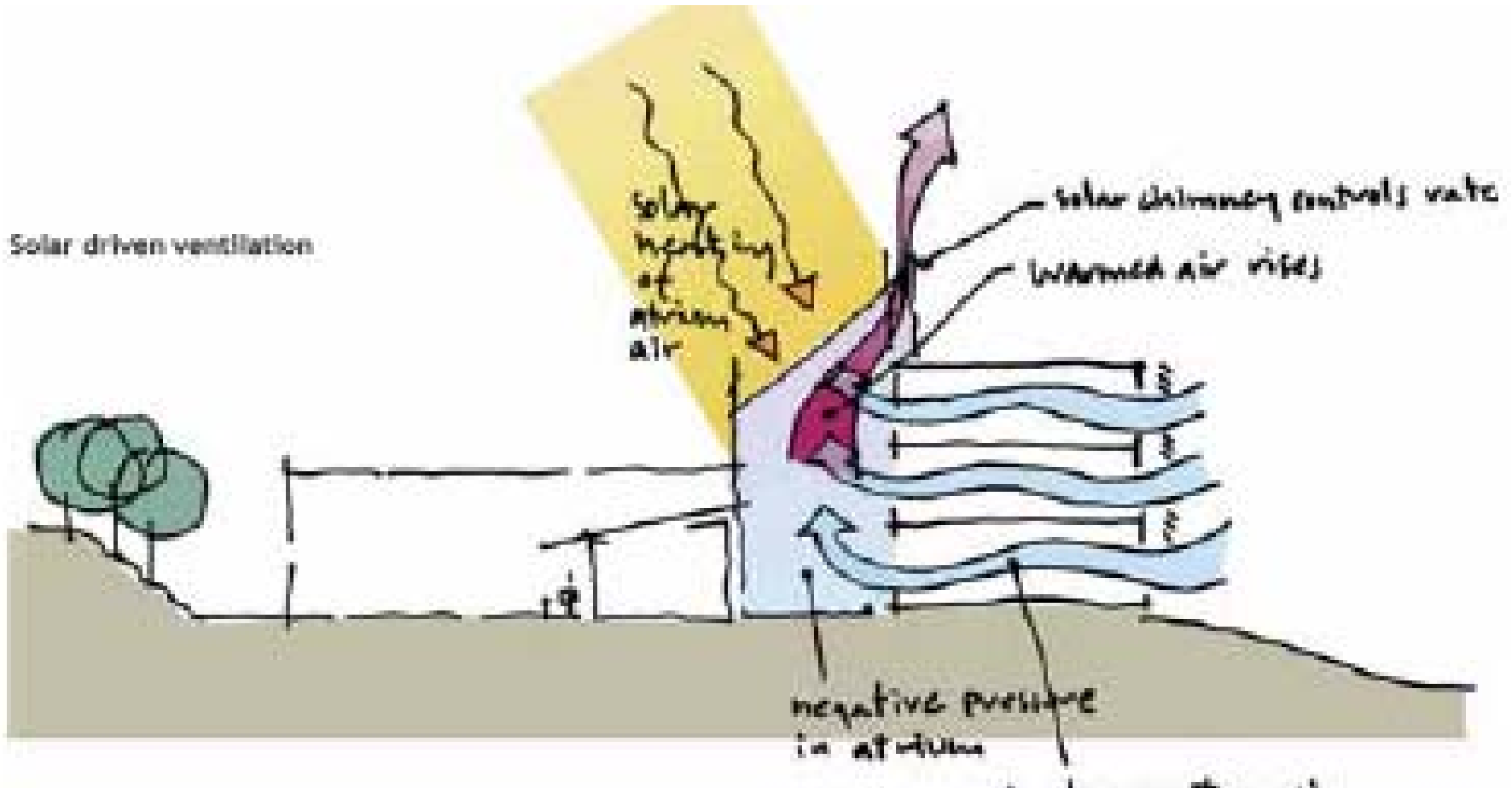
➤ Features of Low Carbon Building

- Well sited and orientated
- Well insulated, thermally massive & airtight
- Natural or tightly controlled ventilation
- Exploits natural daylight
- Renewables

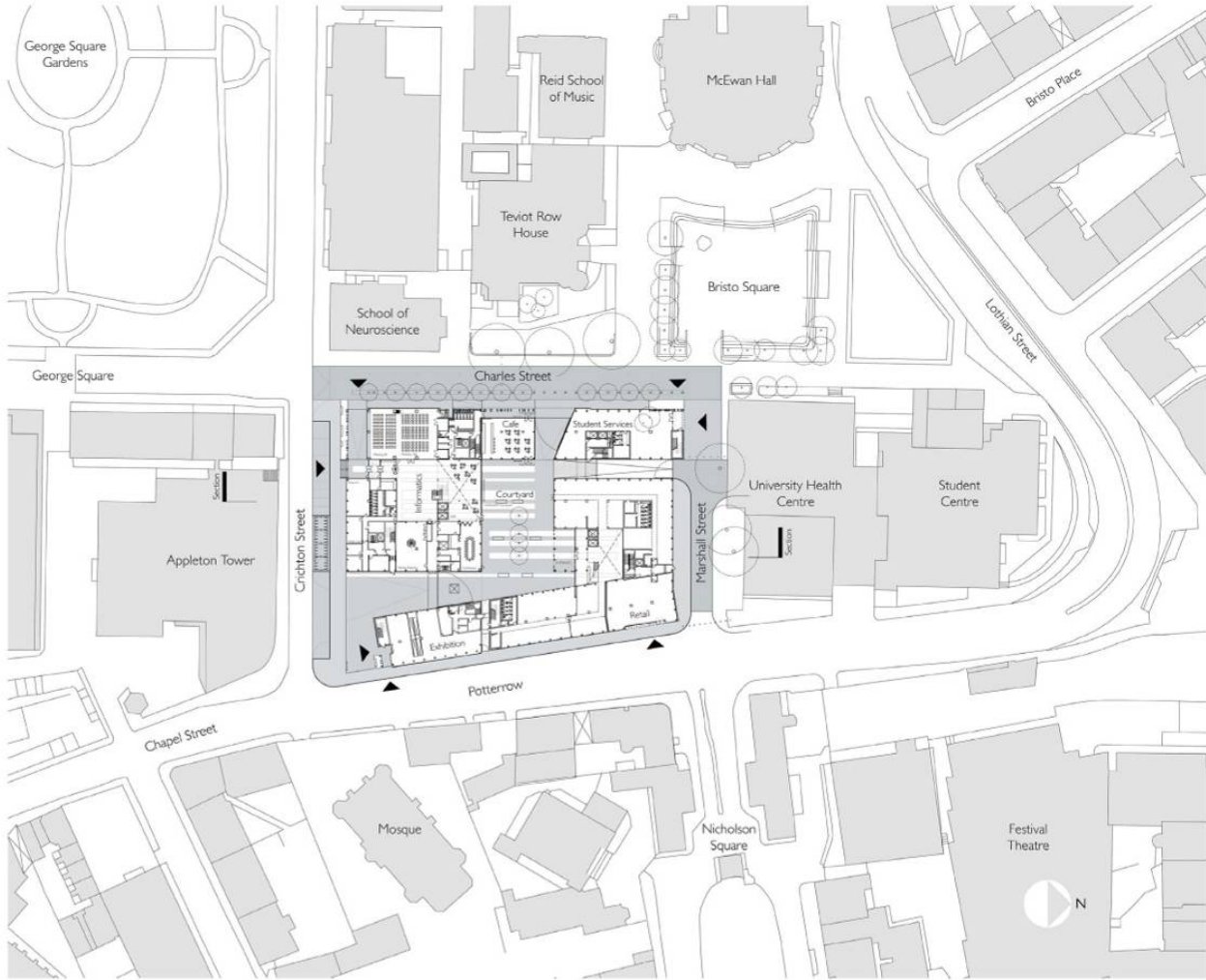
➤ Benefits

- Reduced whole of life cost
- More productive environment
- Future proof
- Enhanced Reputation

The heat from the sun provides the motive power!



Potterrow, Edinburgh University, 2003-



20 March 2008

Bennetts Associates Architects

Potterrow, Edinburgh University, 2003-

Passive Engineering

Thin floor depth and high floor heights for passive design.

Atria used as thermal buffer and stack ventilation driver.

Efficient Glazing ratio- 40%

Exposed Thermal Mass

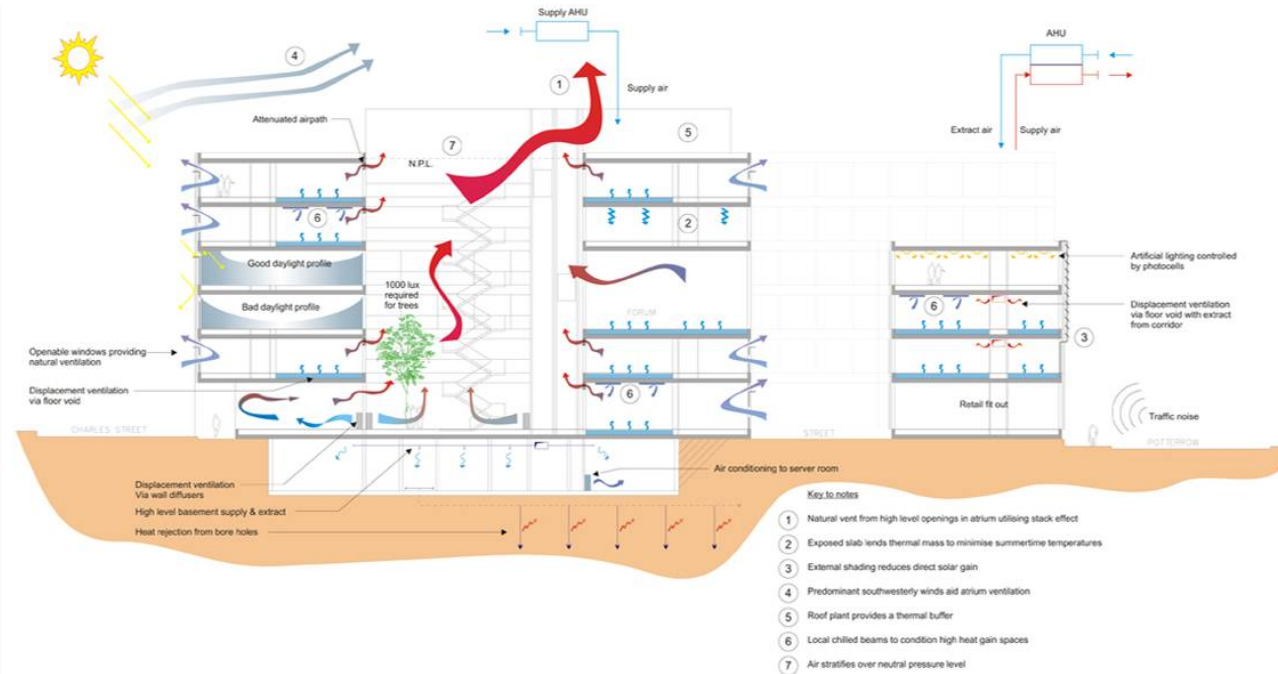
Natural ventilation to perimeter

Daylighting optimisation

Pre-fabricated cladding panels

Low embodied materials

Insulation and 5m³/m² air-tightness testing.



ENVIRONMENTAL SECTION
SUMMER
STAGE C PROPOSALS

POTTERROW
THE UNIVERSITY OF EDINBURGH



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Torphichen Street Edinburgh

- Existing / Speculative Buildings
- Urban Buildings
- Client Briefing
- Post Occupancy
- Aim for Realistic Targets-60%
- Consistently meet targets
- Deal with ICT growth
- A/C comfort v Adaptive Comfort
- Passive Cooling
- Better Prediction
- Integration of Renewables



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Existing Building



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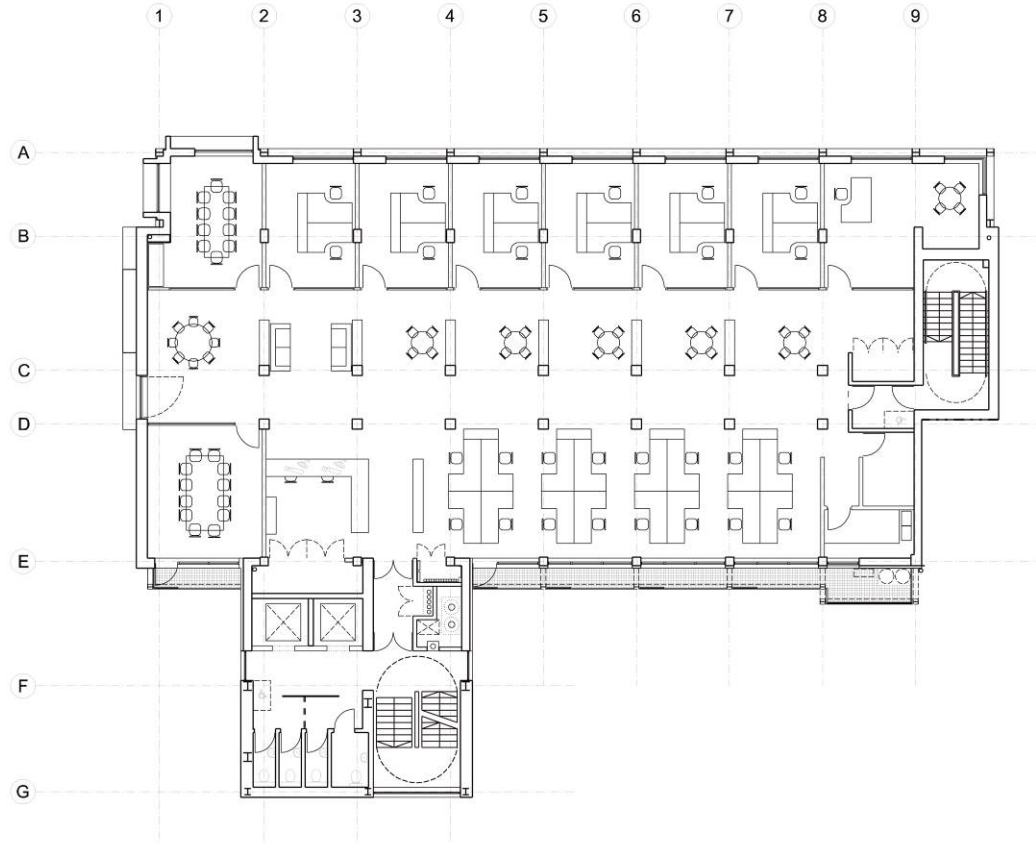
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Typical Floor Plan Layout

Approximate Areas:

Net Office: 490sq.m.
(5,274sq.ft.)

Gross: 598sq.m.
(6,437sq.ft.)



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Sustainable Strategies

Passive:

- Existing concrete structure retained & exposed for thermal stability.
- New highly insulated & air-tight envelope.
- Glazing ratio optimized for passive benefits.
- Shading systems tuned for orientation
- Natural ventilation strategies to all floors – stack ventilation and cross ventilation
- Cooling by exposed thermal mass & night time venting with adaptive comfort ranges.

Active:

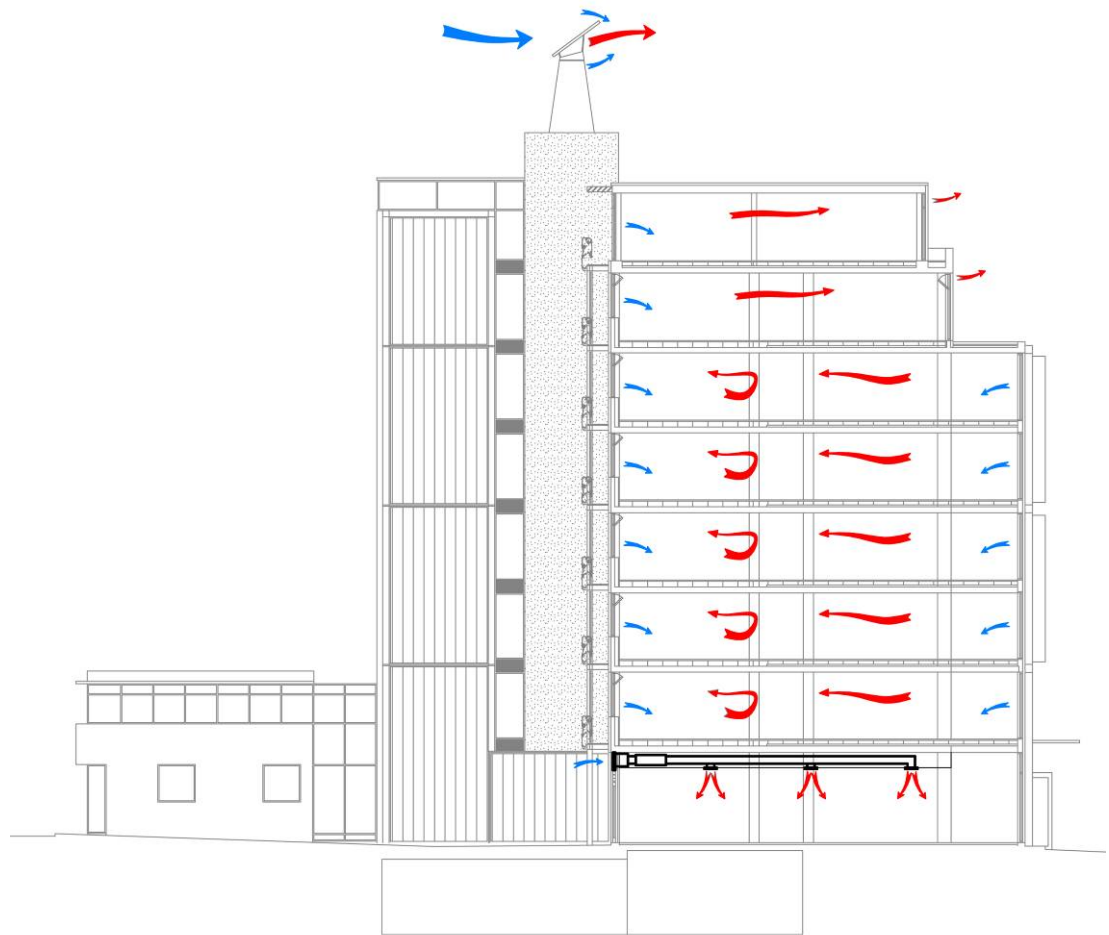
- Variable fans are used only in peak conditions
- Upgrade path for chilled water systems is allowed for if necessary. Lighting is by highly efficient T5 fittings with daylight linked shut off.

Renewables:

- 140m² 23kWp PV Array to provide 10% renewables contribution

Material:

- Low embodied & low toxicity materials chosen as a priority.



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Torphichen Street Edinburgh



Image Credit: Coevolution

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Refurbishing Hampshire County Council's Offices



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Achieving low carbon buildings starts at concept stage



- Orientation
 - Building on a site
 - Spaces within a building
- Form and fabric
 - Daylighting & brightness management
 - Quality ventilation
 - Air tightness, insulation and thermal mass
- Integrating renewables
 - Biomass requires fuel bunkers and lorry deliveries!
 - Groundsource heating/cooling requires boreholes/pipes
 - Solar collectors need to point at the sun!
 - Wind turbines need good quality wind!

Conclusion

- Low carbon buildings are achieved by holistically considering and adopting the options at concept stage
 - with minimal additional cost

- Adding low carbon features to an established design;
 - will give sub-optimal carbon reduction benefits
 - will result in additional cost
 - can be deleted

- The die is cast by the time outline planning permission is granted?