Practical Implications of Zero and Low Carbon Housing

CIFAL

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Issues

- Government targets (80% reduction)
- Lack of guidance
- Compliance
- Technical delivery
- Increasing energy use against a backdrop of efficiency measures
- Measurement process
Issues

• ‘Normalisation’
• Knock on effects
• Training
• Confidence
• Cost
• Commercial delivery/ Incentives
Common problems
Common problems

- Over engineered design solutions
- Poor integration of Low and Zero Carbon Technologies
- Poor workmanship
- Post construction evaluation
- Future upgrading?
- Research and investment
- Resourcing materials
- Resourcing
Low and Zero Carbon Technologies

- Over estimation of performance of technology. improper, inconsistent calculation methods adopted
- Improper design / integration of renewables into any 'non-standard' or 'non-traditional' design. i.e. improper application of products resulting in poor efficiency. i.e. one size does not fit all.
- Quality of workmanship, and its effects on the life of system components and efficiency, thus payback.
- Poor handover information / instructions to occupants regarding controls and efficient operation
- Poor formation of contract with customers, lack of detail in quotes, poor administration of amendments to contract etc
Solar Thermal

- Improper / inadequate fixing of solar collector to roof structure or no consideration of loadings (static and wind) taken into account.
- Poor understanding of system operational temperatures - i.e. compression fittings or hard solder required, high temperature insulation, non plastic pipe clips etc.
- External pipework and penetrations through roof - insulation to be weatherproof, UV resistant (+ bird resistant). Proper flashing kits should be used, as opposed to drilled tiles and mastic seal which will not last.
Heat Pumps

- Ground Source serving underfloor heating - historically very problematic due to no one taking overall responsibility for the system but rather independent parts i.e. 1) ground loop, 2) heat pump 3) underfloor heating system / system internals.
- Lack of communication between the heat pump designer (most efficient at approx 35 degC) and underfloor heating system designer (typically designed for 50-55degC). comprise should be reached regarding system design (typically approx 40-45 degC)
- Ground loop specification typically passed to occupant and works arranged by occupant - no supervision by main contractor that works have been undertaken to a suitable standard.
Wind

- Mis-selling of performance of building mounted turbines
- Improper foundation specification for stand alone turbines (including size/ volume, spec of cement, degree of required reinforcing etc) - again can be typically passed to the customer to arrange with no supervision / responsibility by main contractor
- Obtaining permissions e.g. planning and G83 (notification of export to the grid, 2 way meter etc)
BRE Innovation Park
Developer Brief

• Achieve a CSH rating of greater than 3
• Utilise MMC within the process
• Provide a facility to allow private sector to showcase what they can do
• Facilitate knowledge transfer
• Provide an environment for testing and monitoring innovative technologies
• Create an environment to exploit business opportunities.
## Code Thresholds – Points Scores

<table>
<thead>
<tr>
<th>Level</th>
<th>Points (Mandatory + Points)</th>
<th>Achievements</th>
</tr>
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<tbody>
<tr>
<td>Level 1</td>
<td>36 Points</td>
<td>Above Regulations, EcoHomes 2006 Pass, EST Good Practice</td>
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<tr>
<td></td>
<td>(Mandatory + 33.3 Points)</td>
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<tr>
<td>Level 2</td>
<td>48 Points</td>
<td>EcoHomes 2006 - Good</td>
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<td>(Mandatory + 43.0 Points)</td>
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<td>Level 3</td>
<td>57 Points</td>
<td>EcoHomes 2006 Very Good, EST Best Practice, Conventional Water fittings</td>
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<td>(Mandatory + 46.7 Points)</td>
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<tr>
<td>Level 4</td>
<td>68 Points</td>
<td>Grey water/Rainwater, Passive House (approx)</td>
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<td>(Mandatory + 54.1 Points)</td>
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<tr>
<td>Level 5</td>
<td>84 Points</td>
<td>Zero SAP, Significant Renewables</td>
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<td></td>
<td>(Mandatory + 60.1 Points)</td>
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<tr>
<td>Level 6</td>
<td>90 Points</td>
<td>Zero Operational Carbon, Most Code Credits achieved</td>
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<td>(Mandatory + 64.9 Points)</td>
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BRE INNOVATION PARK

Rethinking School of the Future

The Rethinking School of the Future is a project that aims to demonstrate how an innovative school design can meet the needs of students and teachers while supporting sustainable living. The project uses a modular approach to make the school adaptable to the needs of the community.

COP26's Horizon House

COP26's Horizon House is a model for sustainable living. The house is designed to be energy-efficient, with significant reductions in carbon emissions.

Hanson's House 1

Hanson's House 1 is a demonstration of the potential for sustainable construction. The house features a combination of passive solar design and energy-efficient materials.

Simonstoft's Sigma House

Simonstoft's Sigma House is an innovative design that showcases sustainable building practices. The house is designed to be highly insulated and energy-efficient, reducing its carbon footprint.

Coles' Affordable Home

Coles' Affordable Home is a project that aims to make sustainable housing more accessible. The house is designed to be affordable while still meeting the sustainability standards.

Kingson's Civic House

Kingson's Civic House is a project that demonstrates the potential of sustainable building in urban areas. The design focuses on energy efficiency and the use of sustainable materials.

Buro Happold's Innovative Building Science Centre

Buro Happold's Innovative Building Science Centre is a project that explores the potential of sustainable building technologies. The centre is designed to be energy-efficient and to demonstrate the latest sustainable building practices.
Osborne House
Osborne House - Key Message

Modern Methods of Construction
- Innovative Panelised System
- Speed of delivery
- Factory production quality
- On-site Build Quality

Sustainable
- EcoHomes Excellent Standard
- 40% greater than new Part L
- Renewable technologies
- Aligns with the Code for Sustainable Homes

Affordable
- Cost of build
- Average fuel bill
Hanson’s EcoHouse

- **Code Level 4 – Design**
- 3 bedroom house
- Factory made brick and block walling system
- High thermal mass and passive ventilation
- Wall U Value 0.18
- Roof lantern - utilises the ‘stack effect’ to naturally ventilate
- Solar water system
- Under-floor heating
- Smart technology and Digital communication
- Ground source heating
- SUDS - Includes a rainwater harvesting and geo thermal heating and cooling system
Kingspan Offsite’s Lighthouse

- Code Level 6 – Design & Post Construction
- Two bedrooms
- SIP (Kingspan TEK system)
- Wall U value: 0.11
- Mechanical Heat Recovery Ventilation
- PV panels and solar water heating
- Rainwater harvesting and greywater recycling
Stewart Milne’s Sigma Home

- Code Level 5 – Design
- Three bedroom house
- Split floor design
- Closed panel timber frame system
- Wall U value: 0.15
- Bathroom pods
- Windturbines, solar water heating and PV panels
- Dupont’s Energain system
ecoTECH’s Organics House

- Code Level 4 – Design
- Three bedroom
- Factory made closed panel timber frame/panel walling system
- Steel volumetric units (bathroom and kitchen pods)
- Wall U value: 0.18
- Viessman ventilation and heating system
Willmott Dixon’s Rethinking School

- Eurban solid timber construction (gluelam waste timber)
- Velux roof light and lightwells
- Selection of Claddings (including a recycled mobile phones panel)
- Seedam roof
- Integrated toilets
- ICT infrastructure (flexible & adaptable)
Winning Design: GREEN HOUSE
Architect: Gaunt Francis Architects
Key Lessons Learnt

- Code level 4 – Commercially viable
  - can be achieved with good design
  - Minimal use of renewable and low carbon technologies
- Energy Strategy
  - Building vs. Development Approach
  - Onsite vs. Offsite renewable energy for level 5 & 6
- Systems Integration is critical
  - Systems integration failure
  - Reliability & Longevity
- Buildability
  - Quality Control
  - Workmanship skills
- Integrated Team
  - Supply Chain Integration
  - Value engineering & Risk management
Added Value

- 6 build partners investing £500k + in each plot
- 50 innovations/design solutions per plot
- 300 Business partnerships
- ICT and visitors centre (EEDA investment), piloting remote and wireless visitor technology
- Next phase includes 4 additional houses, including 1 commissioned by Prince Charles
- Next phase over subscribed as success recognised by existing build partners and wider industry
- Brand exposure through roll out of innovation parks nationally
- International aspects being considered
Added Value

- 10,000 Professional visitors in 2007
- Business linkages with increased knowledge of product integration
- Product improvement
- Increased sales
- Product showcase and market exposure
- 40 TV crews have showcased the site
- R&D investment
- Knowledge transfer
What Next

- Scottish innovation park
- Integration of LZCT
- Meeting the 2013 regs by 2009
- Regional/Rural issues
- Demonstrate innovative methods of construction and renewable technologies
- Test and measure policy impacts
- Low Carbon Technologies
- Affordability
- Climate Proofing
- Process Innovation
- Refurbishment/Retrofit
- Lifetime Homes
Summary

• Keep it simple
• Maximise fabric thermal performance
• Eliminate thermal bridging
• Eliminate condensation
• Ventilate but maximise air-tightness
• Integrate Low Carbon Technologies
• Affordability
• Climate Proofing
• Process Innovation
• Refurbishment/Retrofit ?
• Lifetime Homes
Questions?

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