Recent comments from Paul Chan

The ZCB is the first zero carbon building in Hong Kong. It enhances people’s knowledge on the sustainable lifestyle. The ZCB is focused on the harmony between natural ecological environment and buildings. Its main features can be summarised in four “E’s”:

1. Educating: open to the public
2. Evaluating: 2,800 intelligent monitoring devices;
3. Experimenting: The most advanced design and technology for environmental friendly building and sustainable lifestyle;
4. Evolving: responding to the ever evolving technology and requirements in low carbon and green building.
Climate Change Summit – September ‘14

- Obama said America had a “mission” to act and help smaller countries in the fight against climate change. He added: “That’s what big nations have to do.

- “Today I call on all countries to join us, not next year or the year after that but right now, because no nation can meet this global threat alone.

- "We are the first generation to feel the effect of climate change and the last generation who can do something about it."
Mr Cameron UK Prime Minister said: "We cannot put this off any longer. To achieve the deal we need all countries to make commitments to reduce emission.

"Our agreement has to be legally binding, with proper rules and targets to hold each other to account. And we must provide support to those who need it, particularly the poorest and most vulnerable."

Mr Cameron said it was unrealistic to expect undeveloped countries to forgo the economic growth enjoyed by nations which had benefited from carbon
The most important statement came from China’s Vice Premier Zhang Gaoli. China, he said, would publish “as early as possible” a date at which it expected its greenhouse gas emissions to peak.

Since China is now by far the world’s largest emitter of greenhouse gases, averting dangerous climate change will only be possible if its emissions stop rising within the next ten years and then begin to fall. Previously China had not committed to any timetable for this and are now expect it to do so in the next few months.

President Obama called on China, as a fellow “big country”, to show joint leadership with the US. If China publishes an early date for its emissions to peak, it will be America which comes under the greater pressure to fulfil its global obligations.
WHO WE ARE
WHAT WE DO

The Road to Zero Carbon
PURPOSE AND STRATEGIC OBJECTIVES

“Facilitate the mainstream delivery of low and zero carbon homes in the UK”

- Provide leadership and create confidence
- Reduce risk and clear obstacles
- Disseminate information

ROLE of the ZERO CARBON HUB in the UNITED KINGDOM
CLIMATE CHANGE – EXPECTED INCREASE IN TEMPERATURE

Increase in the number of extremely warm days (2080s)

Winter: 6-12 days/year  
Summer: 12-30 days/year
1998-2007 was the warmest decade on record.

2009 – 5th warmest globally and 14th warmest in the UK.

2012 Hottest day ever in Scotland and wettest June in the UK.

2013/4 was the wettest winter on record.
CARBON CULPRITS

Residential emissions:
- 3% cooking
- 4% wet appliances
- 6% lighting
- 6% consumer electrics
- 21% water heating
- 53% space heating

Non-residential emissions:
- 3% other
- 3% office equipment
- 6% water heating
- 11% cooling and ventilation
- 23% lighting
- 8% catering
- 4% other
- 46% space heating
UK IN FOCUS

The Road to Zero Carbon
UK POLICY

- UK Government has made a Commitment to reduce carbon emissions by 80% by 2050 and by at least 26% by 2020 against a 1990 baseline.

- Homes contribute 27% of UK’s CO2

- All new domestic buildings will be Zero Carbon from 2016

- All new commercial buildings will be Zero Carbon from 2019

- Existing Homes Carbon are addressed via a mechanism to allow the cost of improvements to be paid via energy bills

- There are no plans to address existing commercial buildings at this time
The Zero Carbon Hierarchy – stepped progress towards a workable definition.

Zero Carbon = Solutions addressing the carbon emission reductions that are difficult to achieve on site

Carbon Compliance = On-site heat and power generation

Building fabric performance

Energy efficiency

On-site low/zero carbon energy (and connected heat)

Allowable solutions

On-site heat and power generation

Compliance = Energy efficiency + On-site heat and power generation + Off-site solutions

The Zero Carbon Hierarchy – stepped progress towards a workable definition.
UK ZERO CARBON HIERARCHY

On site low/zero carbon heat and power

Fabric Energy Efficiency

Allowable Solutions

UNREGULATED EMISSIONS (cooking, electrical appliances)

REGULATED EMISSIONS (heating, ventilation, lighting)

 chronological order of options
THE ENERGY EFFICIENCY STANDARD

Building Fabric:
- U-values
- Thermal mass

Thermal Bridging

Air-permeability

Orientation, solar gains, Glazing proportion
Target Carbon Compliance of 10 kg CO₂/m²/year for detached homes
11 kg CO₂/m²/year for attached homes
14 kg CO₂/m²/year for apartments

Approach provides solutions for a range of practical situations:

- On gas grid ‘PV’
- On gas grid ‘Fabric’
- Off gas grid Heat Pump
- Community Heat Network
Roof space availability for PV/solar technologies considered a limitation on high rise
<table>
<thead>
<tr>
<th>Smart appliances</th>
<th>District heating</th>
<th>Energy from waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home electrical vehicle charging</td>
<td>Retrofit lzc technologies to local community buildings</td>
<td>LC Energy generation larger scale</td>
</tr>
<tr>
<td>Electricity storage for home</td>
<td>Local micro hydro schemes</td>
<td>Investment in carbon cooling</td>
</tr>
<tr>
<td>LED streetlights for a development</td>
<td>Local energy storage schemes</td>
<td>Investment in embodied carbon reduction</td>
</tr>
</tbody>
</table>
The Future of retrofit projects: THE GREEN DEAL

- Desire for market led solution
- Millions of homes without double glazing
- Half of homes do not have sufficient insulation
- UK committed to reduce its GHG emission by at least 80% by 2050 from 1990 levels.
**Site Conditions:**
- Access
- Location (regional weather)
- Ground conditions
- Flood risk
- Existing trees, water bodies etc
- Local energy resource – source for biomass, wind
- Existing district heating network

**Planning:**
- Dwelling type mix/ density
- Built form considerations - roof pitch, building height etc
- PV and solar panels
- Local Renewable targets

**Site Layout:**
- Dwelling types
- Design for solar technologies:
  - Orientation for solar technology
  - Roof pitch
  - Over-shading

**Other:**
- Localism

What is the energy strategy?
AN INTERNATIONAL CONTEXT

The Road to Zero Carbon
KYOTO – WHO’S ON TARGET

Russia
Sweden
UK
France
Germany
Japan
Switzerland
Netherlands
Denmark

Australia
New Zealand
Canada
Austria
Ireland
USA

China?
As the world’s first industrialised nation, fossil fuels have played a key part in the United Kingdom’s rapid growth since the 19th century. However, recent years have seen strong political support for the decarbonisation of the UK’s energy system, placing it ahead of most countries in the recognition of the importance of this shift. Climate change mitigation and adaptation have been made a priority domestically, while the UK is a global leader in promoting energy efficiency worldwide. Although oil is still an important part of the UK’s energy balance, contributing 37% to the country’s total energy consumption in 2013, the total generation from renewable energy reached 15% during the same year, with overall renewable energy use tripling between 2000 and 2012.

The UK is one of the world’s most energy efficient countries, in part due to successful efficiency improvement across the economy. An area which still offers significant savings is the built environment, with policy seeking to improve the performance of both new and existing buildings. Part L of the Building Regulations requires that all new homes be zero carbon by 2016 (and all non-domestic buildings to be zero carbon by 2019), while the ambitious Green Deal scheme allows consumers to receive energy efficiency improvements with no up-front costs (which are ultimately recovered by the installer through charges on the consumer’s now reduced energy bill). This year saw the beginning of a large scale rollout of smart meters across the country, where 53 million units will be installed by 2019.

**KEY FACTS**

- **Population**: 63.7 million
- **Area**: 243,610 km²
- **Density**: 263 people/km²
- **% of population in cities**: 79.6%

- **24.5 million** Number of houses

- **26%** Population in megacities (over 1 million residents)

- **516** Motor vehicles per 1000 people

- **5,472 kWh** Electric power consumption per capita

- **79 MtCO₂** CO₂ emissions per capita

- **31%** of total energy used by residential sector

- **16.1%** Electricity generated from renewables

- **-27°C to 38°C** Average temperature
China continues to top numerous global rankings, as the world’s most populated country, the biggest energy consumer and producer, the largest emitter of global carbon emissions and the world leader in renewable energy production.

Despite its extensive natural resources, the Chinese government has placed a significant priority on expanding the number of renewable and natural gas fired plans in the country as part of its 12th Five-Year Plan. The plan includes a priority to reduce the high carbon and energy intensity of China’s economy by 17% and 16% between 2010 and 2015, respectively. The Government is also seeking to encourage greater private investment in the nation’s energy market by streamlining the project approval process and loosening control of energy prices. The Five-Year Plan also includes details regarding the mass deployment of renewable energy, with targets including 100GW of wind, 35GW of solar and 13GW of biomass.3

Beyond energy, there is a growing focus on green building in China, with the first LEED building in the country certified in 2005. By 2020, it is expected that green construction will account for 30% of all new construction. This is a significant number, as China surpassed the United States in 2010 as the world’s largest construction market. Overall, a lack of understanding of the potential costs savings associated with green building means the demand for energy efficient homes remains low, but rising air pollution in urban centres has helped improve awareness.4

**China**

**Capital:** Beijing

**19% of the global population**

**Globally**

**Coal**

**Oil**

**Largest 2nd Largest Producer & Consumer**

**49% of forecasted emissions between 2010 and 2040 are expected to be emitted by China alone**

**The World’s Largest Wind Energy Producer**

**The second largest exporter of low carbon technologies and environmental services worldwide**

**To tackle smog in first half 2014 Beijing cut coal consumption 7%**

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**Key Facts**

- **Country population:** 1,355 billion
- **Area:** 9.6 million km²
- **Density:** 145 people/km²
- **% of population in cities:** 50.6%
- **435 million houses**
- **22% population in megacities (over 1 million residents)**
- **69 motor vehicles per 1,000 people**
- **3,298 kWh electric power consumption per capita**
- **6.2 mtCO₂ CO₂ emissions per capita**
- **22% of total energy used by residential sector**
- **20.7% Electricity generated from renewables**
- **Average temperature:** -52°C to 50°C
Though a leading financial centre both in Asia and worldwide, minimal natural resources and a reliance on imported goods in Hong Kong, including energy, has put a focus on energy security and the long-term sustainability of the island nation. As a Special Administrative Region of China, the country relies heavily on energy supply from the mainland, with 25% of its electricity imported. Low levels of domestic energy production means Hong Kong solely relies on fossil fuels for power, contributing to its large ecological footprint, one of the highest in the Asia-Pacific region. In fact, residents use 150 times the level of resources than the territory can provide, second only to Singapore. High levels of air and water pollution are the result of coal-fired power stations and traffic, as well as the numerous factories that dot the neighbouring Pearl River Delta. As a result, a Clean Air Plan for Hong Kong was released in 2013, which outlined concrete policies, measures and plans to address these challenges.

Though leading globally in high-rise accommodation, there is still room for improvement, with building’s consuming nearly 90% of the city’s electricity, the majority of which is used for air conditioning. To tackle this, Hong Kong’s Green Building Council launched HK3030 in 2012 with the target of encouraging the reduction of electricity consumption of buildings by 30% from 2005 by 2030, while the nation’s first Green Building Week took place in September 2013.
SMART HOUSES

Incoming energy use

| Today: pulse & toroid etc | Smart meters: CAD |

Monitor & control inc. energy manager

C-HAN Consumer Home network

Internet, Satellite, GSM etc

Sensors
- lux
- presence
- humidity
- air quality
- zone
- temperature

Other loads eg
- EV
- Heat pump
- heating
- lighting
- media
- security
- comms

Solar Thermal

Grid

PV
RESEARCH PROJECTS

The Road to Zero Carbon
Monitoring and Measurement

• Coheating
• Thermography
• Blower door / airtightness
• In situ u-values
• Energy supply measurement
• Photographic survey
• MVHR commissioning
THE LATEST HUB RESEARCH PROJECTS INCLUDE:

- The Performance Gap
- Overheating
- Ventilation
- Consumer Research
THE PERFORMANCE GAP

The Road to Zero Carbon
Ambition

Closing the performance gap – the 2020 ambition:

From 2020, be able to demonstrate that at least 90% of all new homes meet or perform better than the designed energy/carbon performance.
The Journey so far
Prioritisation of issues

- Knowledge & Skills
- Responsibility
- Communication

Impact on the Performance Gap

Evidence

- Priority for Research
- Priority for Action
- Retain a Watching Brief
- No Immediate Action

NONE  |  EMERGING  |  CLEAR
LOW   |  MEDIUM    |  HIGH
‘End of Term’ Report Recommendations

Industry
- Performance Assessment R&D
- Skills and Knowledge Development
- Construction Details Scheme
- Continued Evidence Gathering

Government
- Signal Clear Direction
- Stimulate Industry Investment
- Strengthen Compliance Regime
- Support Skills & Knowledge Development
OVERHEATING

The Road to Zero Carbon
Heat waves in context

- **Over 5000** people died in the UK of heat-related causes in the extreme heat wave of 2003

- **31,100** excess winter deaths occurred in England and Wales in 2012/13 (ONS)

- **Key point** - Summers as hot as 2003 could happen **every other year** by the year 2050 (Met Office)
Evidence gathering

- Review literature and gather expert opinion
- Detailed reviews and create definitions
- New monitoring and testing data
VENTILATION

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INDOOR AIR QUALITY

Volatile Organic Compounds
CO2
High Humidity
CONSUMER RESEARCH

The Road to Zero Carbon
Helping the Consumer = Understanding them

- Do our customers like their Low Energy Homes?
- Are they comfortable?
- Are the controls easy to use?
Thank you / 谢谢 / 謝謝

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