

An Introduction

The logo for the Housing Summit, featuring a stylized white graphic of a building or structure on the left, followed by the text "Housing Summit" in a white, sans-serif font on a dark red background.

Housing
Summit

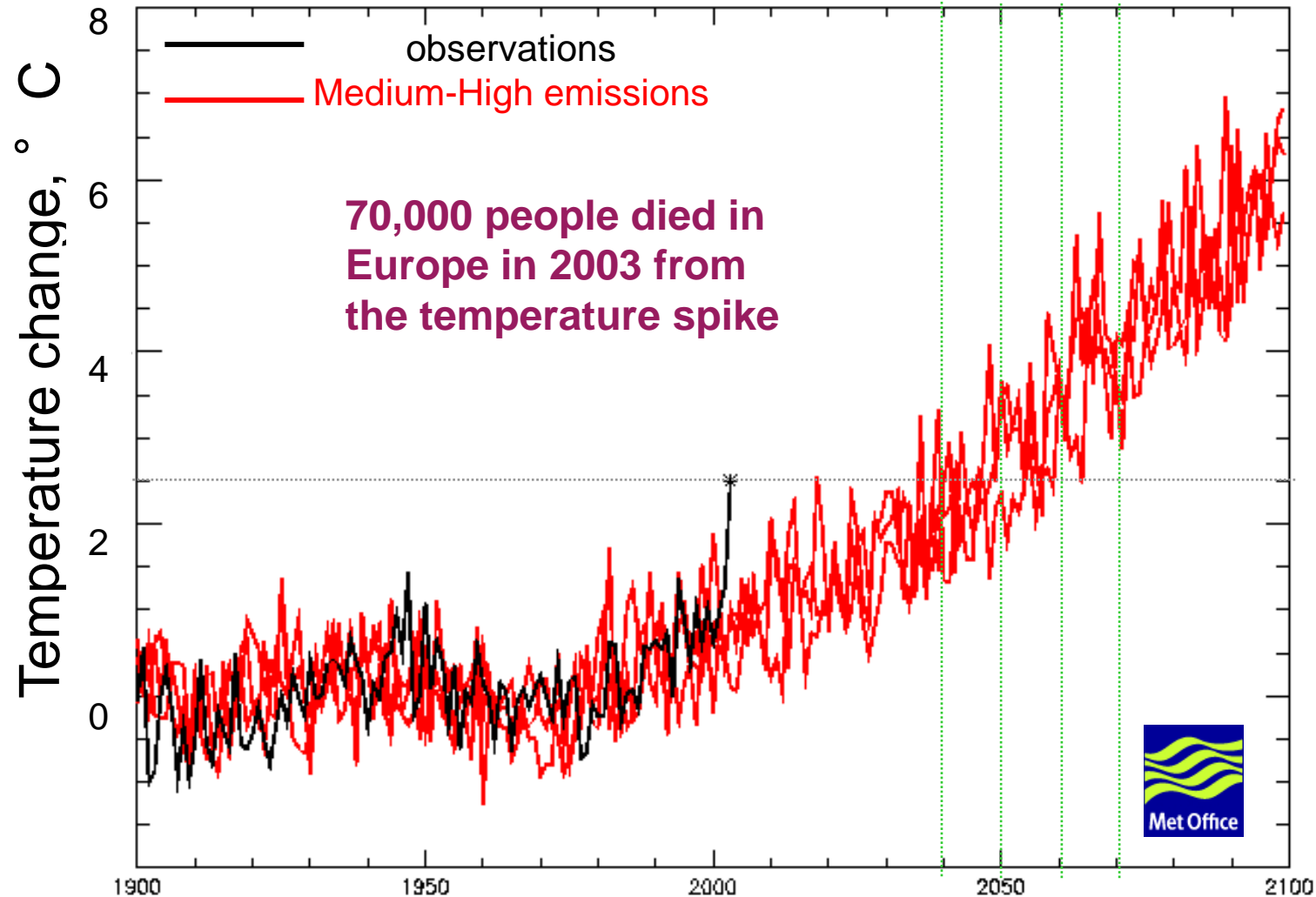


Robert Pannell

- Partner of 'The Buildings Hub'
- 37 years at construction company, Taylor Wimpey - Responsible for Design, Construction and Sustainability
- Formally Managing Director 'Zero Carbon Hub' UK 2008 – 2016
- Technical & Quality Advisor to Modular House Builder known as TopHat
- Visiting Lecturer and Examiner, Architecture and Engineering faculty, Bath University



The Journey – Temperature change

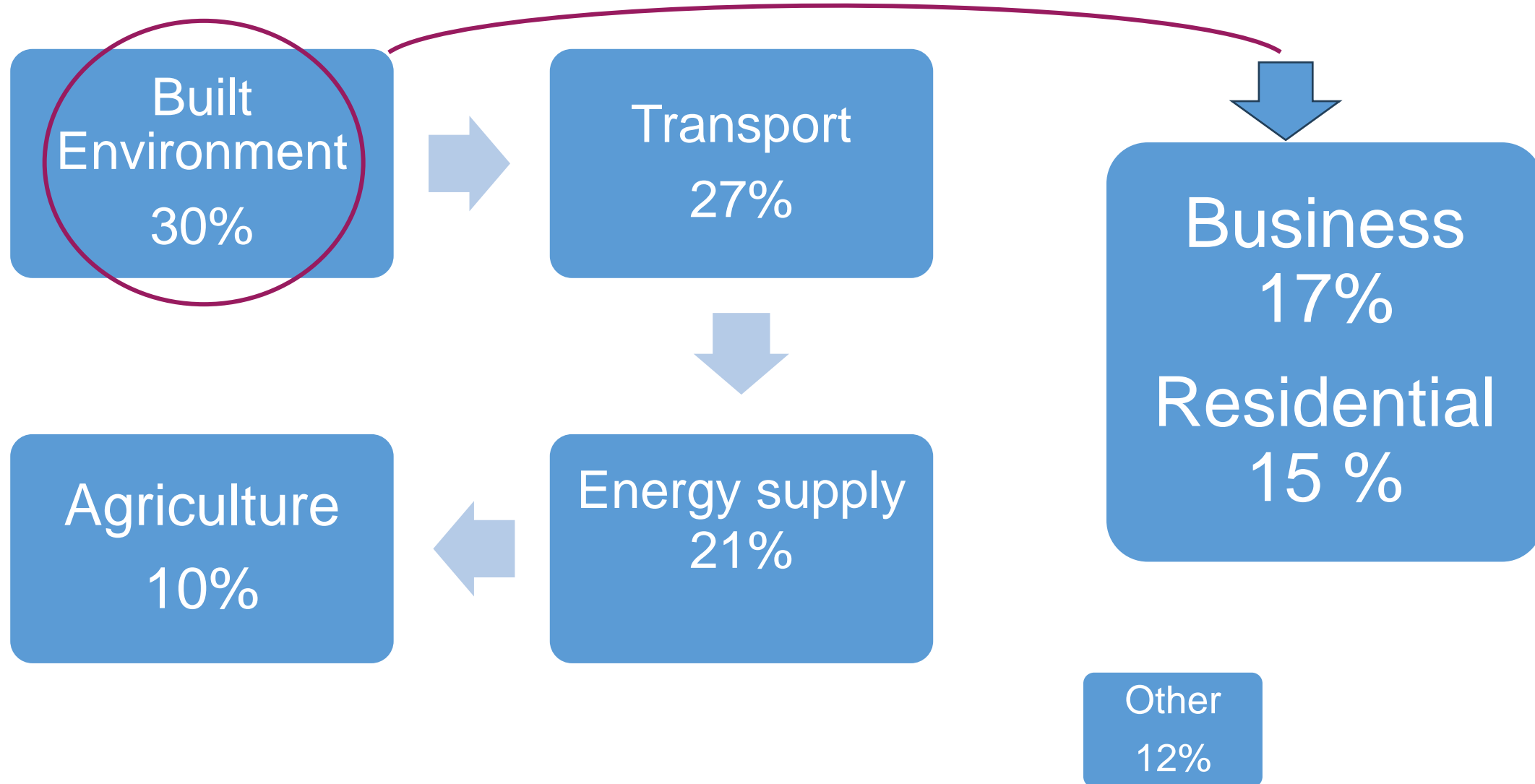


2100 Six degrees hotter



The building we are constructing today will not cope with a 6 degree temperature change without air condition or expensive fabric improvements.

The Journey – Carbon Culprits UK



The Journey – Carbon Culprits

3% cooking

4% wet appliances

3% other

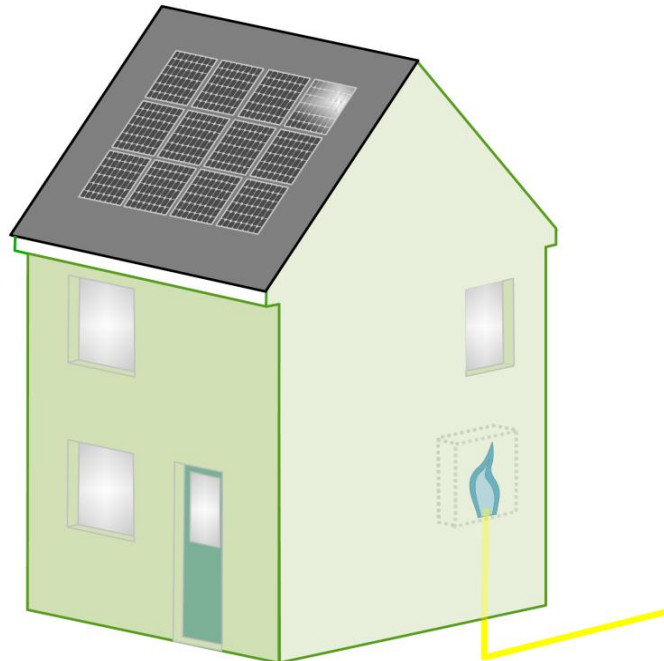
5% cold appliances

6% lighting

21% water

53% space heating

6% consumer electrics



3% office equipment

8% catering

46% space heating

3% other

11% cooling

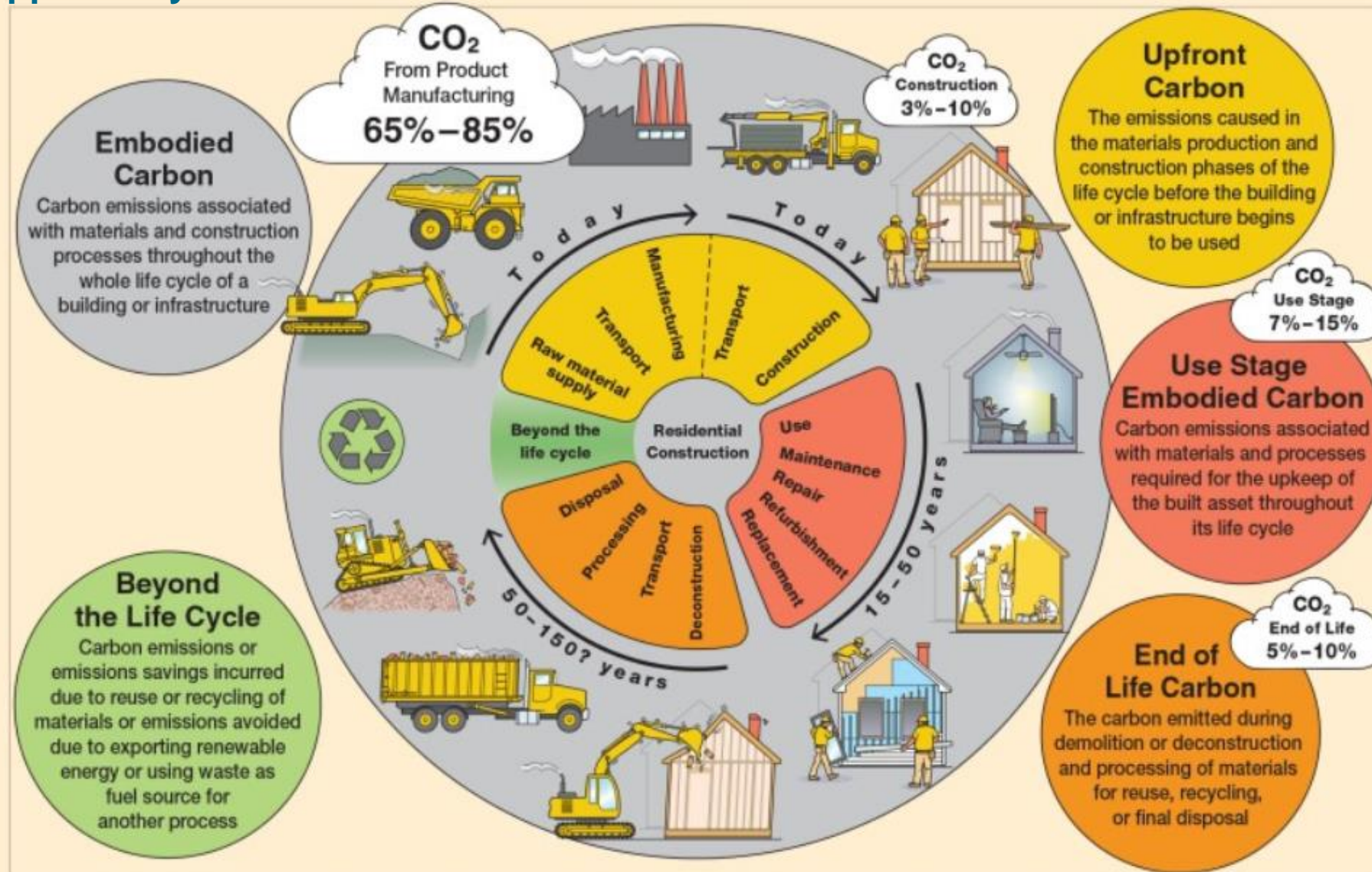
6% water heating

23% lighting



The Journey – Embodied Carbon UK

An opportunity for New Zealand



The Journey – A Short UK History

The Callcutt Report – Commissioned by UK Government in December 2006 published in 2007 by the Secretary of State

Terms of Reference:

‰ To examine how the supply of new homes was influenced by the nature and structure of the housebuilding industry, its business models and supply chain, including land, materials and skills

‰ To consider how these factors influence the delivery of new homes to achieve the Government's housing target, meeting house buyers' requirements and aspirations

□ Achieving high standards of energy efficiency and sustainability as set out in the Code for Sustainable Homes, and progressing to a zero carbon Standards by 2016

The Journey – A Short UK History

**The Callcutt report stated:
Sustainability, Zero Carbon and Water**

Government to give strong and sustained commitment to regulate in order to achieve zero-carbon 2016 target

Government to define zero-carbon performance no later than 2008

Ensure regulatory framework for zero carbon verified in building control inspections

A “delivery unit to monitor, co-ordinate and guide the zero-carbon programme”

The Journey – A Short UK History



The Zero Carbon Hub was born

Purpose and Strategic Objectives of the Hub

Facilitate the mainstream delivery of low & zero carbon homes

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

A collaboration between the Government & the Construction sector

Ensuring that they are:

- Buildable on a mass scale
- Technically achievable
- By an average tradesman

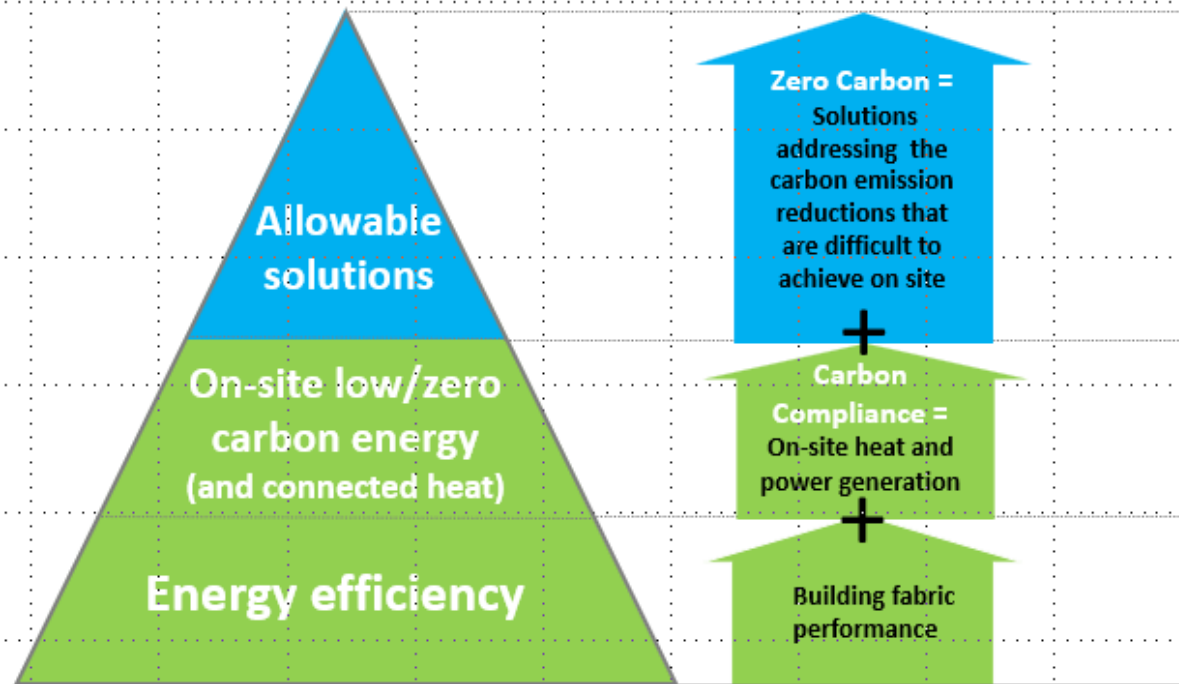


The Journey – The Brief



Government
Guidance

Meeting Zero Carbon Targets



The Zero Carbon Hierarchy



The Journey – Delivery Programme



Programme Delivery Timeline Report No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Date	Oct 2008	Jan 2009	Apr 2009	Oct 2009	Jan 2010	Nov 2010	Mar 2011	Jun 2011	Sep 2011	Nov 2011	Jan 2012	May 2012	Jun 2013
OVERALL PROGRAMME STATUS	A	A	A	A	A	A	A	A	RA	RA	RA	RA	R
General comments	/	/	AG	AG	AG	/	/	/	/	/	/	/	/
EPBD	/	/	A	A	G	/	/	/	/	/	/	/	/
Definition of Zero Carbon	/	/	A	AG	(See below)								
Fabric Energy Efficiency Standard (FEES)	/	/	/	/	G	G	G	G	G	G	G	G	G
Carbon Compliance	/	/	/	/	AG	G	G	G	AG	AG	A	A	RA
Allowable Solutions	/	/	/	/	R	RA	RA	R	R	R	R	R	RC
National Calculation Methodology - SAP	/	/	AG	RA	RA	RA	RA	R	R	R	R	R	R
Design vs As-Built Performance	/	/	/	/	/	/	/	/	/	/	/	/	G
Low carbon pre-production homes	Scaling up examples of low carbon and zero carbon homes	/	AG	AG	AG	AG	AG	A	A	A	A	A	RA
Zero carbon prototype homes		/	AG	AG	AG								
Scale-up		/	AG	RA	RA								
Knowledge and Skills	/	/	A	A	A	AG	AG	A	A	A	A	A	A
Miscellaneous	/	/	AG	AG	AG	/	/	/	/	/	/	/	/
Community and large scale energy solutions	/	/	/	/	/	A	A	A	A	A	A	A	A

RAG Status set

.... And the unexpected

OVERHEATING

PERFORMANCE GAP

Also set



The Journey – Where do we start?



Energy

Building

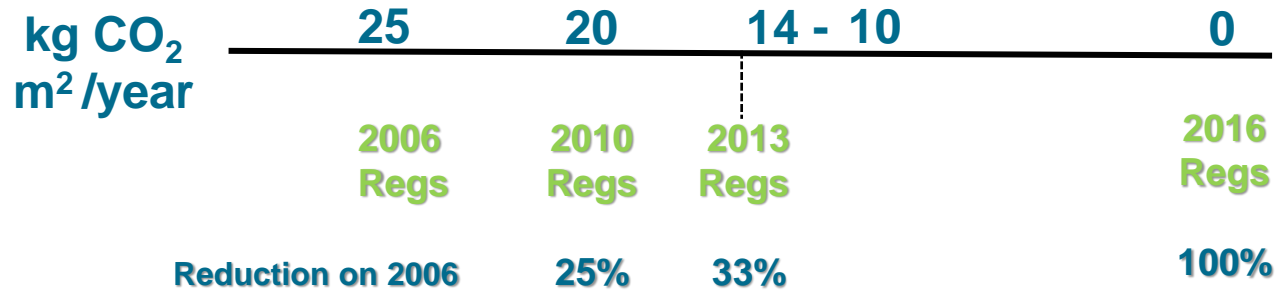
Examples

Consumer

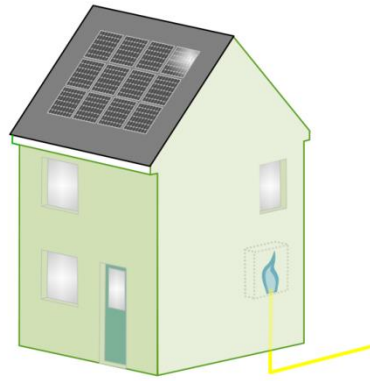
Skills



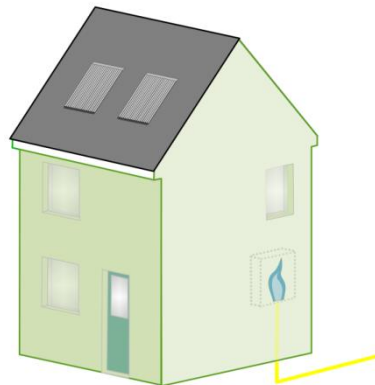
The Journey – Delivery Programme 2008



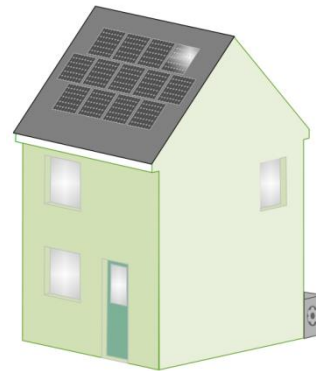
Approach provides solutions for a range of practical situations:



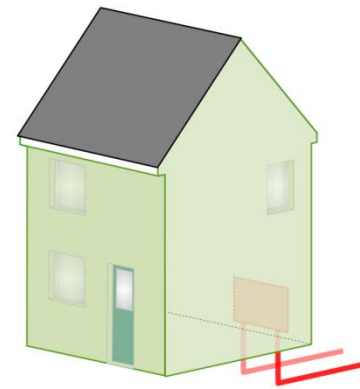
On gas grid
'PV'



On gas grid
'Fabric'



Off gas grid
Heat Pump &
PV



Community Heat
Network from Heat
pumps

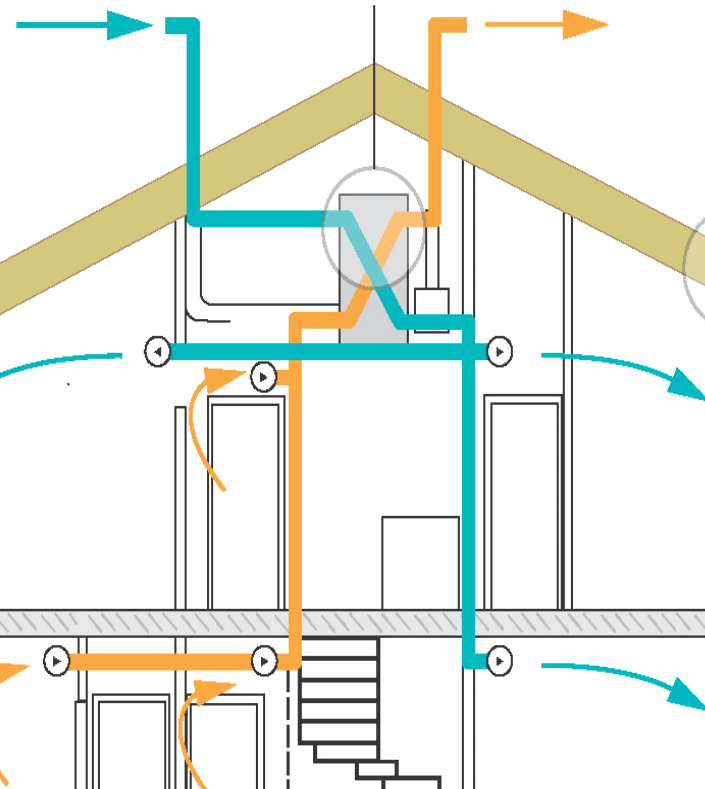


The Journey – The design considerations



Balanced ventilation with Energy Recovery Ventilation

Some form of balanced heat and moisture recovery is required in most climates.



High-Performance Components

High-performance windows typically triple-paned for cold climates and doors provide thermal comfort and building durability.

Continuous Insulation

higher than typical levels of continuous insulation are included through the entire envelope.

Airtightness

The building envelope is extremely airtight, preventing infiltration of outside air and loss of conditioned air as well as ensuring moisture free assemblies.

Shading and Solar Design

Solar gain is managed to exploit the sun's energy for heating while shading elements work to minimize overheating in cooling seasons.

Thermal Bridge-Free Construction

The building envelope is designed to eliminate thermal bridges. A thermal bridge is a highly conductive material that extends from within a building's envelope to the outside air.



The Journey – The U value options



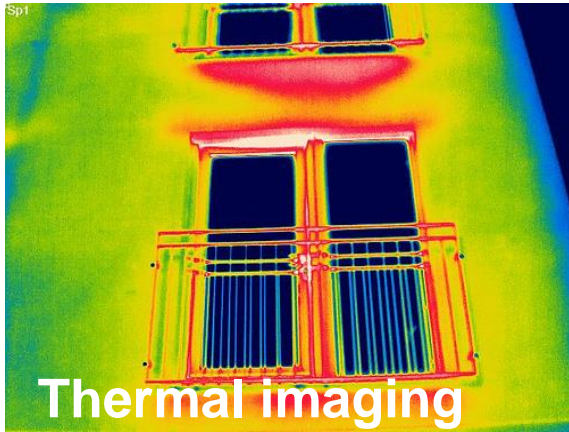
	Current practice 2006	Expected future practice 2016					PassivHaus equivalent		
	Baseline	Spec A (NV)	Spec B (MVHR)	Spec B (NV)	Spec C- (MVHR)	Spec C- (NV)	Spec C (MVHR)	Spec C (NV)	Spec D (MVHR)
External Walls	0.28	0.25	0.18	0.18	0.15	0.15	0.15	0.15	0.15 – 0.09
Party Walls	0.5	0	0	0	0	0	0	0	0
Floor	0.2	0.2	0.18	0.18	0.15	0.15	0.15	0.15	0.15 – 0.08
Roof	0.16	0.15	0.13	0.13	0.11	0.11	0.11	0.11	0.10 – 0.06
Windows	1.8 (double)	1.5 (double)	1.4 (double)	1.4 (double)	1.2 (double)	1.2 (double)	0.8 (triple)	0.8 (triple)	1.0 – 0.6 (triple)
Doors	1.6	1.4	1.2	1.2	1	1	1	1	0.8
Air leakage (m ³ /hr/m ²)	7	5	3	3	3	3	1	3	1.26 – 0.41
Thermal bridging (W/m ² K)	0.08	0.06	0.05	0.05	0.04	0.04	0.04	0.04	0.04
Ventilation	Natural (extract fans)	Natural (extract fans)	MVHR	Natural (extract fans)	MVHR	Natural (extract fans)	MVHR	Natural (extract fans)	MVHR



The Journey – Its Challenges !!



Blower door



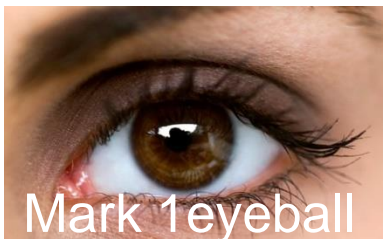
Co-heating



Heat flux sensor



5 second monitoring



Mark 1 eyeball

Testing

Measurement of a Zero Carbon building was a nightmare !!

How do we prove these buildings are doing what it says on the tin !!



The Journey – Problems !



PROPOSAL
v1.0b - 26th September 2012

Closing the Design vs As-built Performance Gap

Executive summary

Context
There is persuasive and growing evidence of a gap between the as-designed and as-built performance of new homes. The Zero Carbon Hub has previously investigated the evidence base and called for action to close the gap – which will need engagement from all participants in the design-construction-verification cycle, and support from government.

Knowledge Gap

In terms of the performance of new homes, the Zero Carbon Hub's Carbon Compliance Task Group recommends that: "From 2020 the test results distribution should demonstrate that at least 90% of all dwellings would meet or perform better than the designed energy/ carbon performance".

The Part L 2013 consultation proposals for "an end-to-end Quality Assurance process incentivised via a confidence factor approach to tackle the performance gap did not gain favour in the responses, although the potential existence of a gap still the need to tackle it was recognised.

This proposal forms an alternative approach to closing the design vs as-built performance gap which the Zero Carbon Hub believes will be more successful and for which it has industry support.

Main aim
The main aim of the project will be to improve the as-built performance of new homes and enable the 2020 ambition to be met.

Page 1 of 16

- New project
Led by the Zero Carbon Hub
- Collaborative
Industry & Government
- Initial funding
January 2013 – March 2014

The Performance Gap

Buildings don't do what they are designed to do !

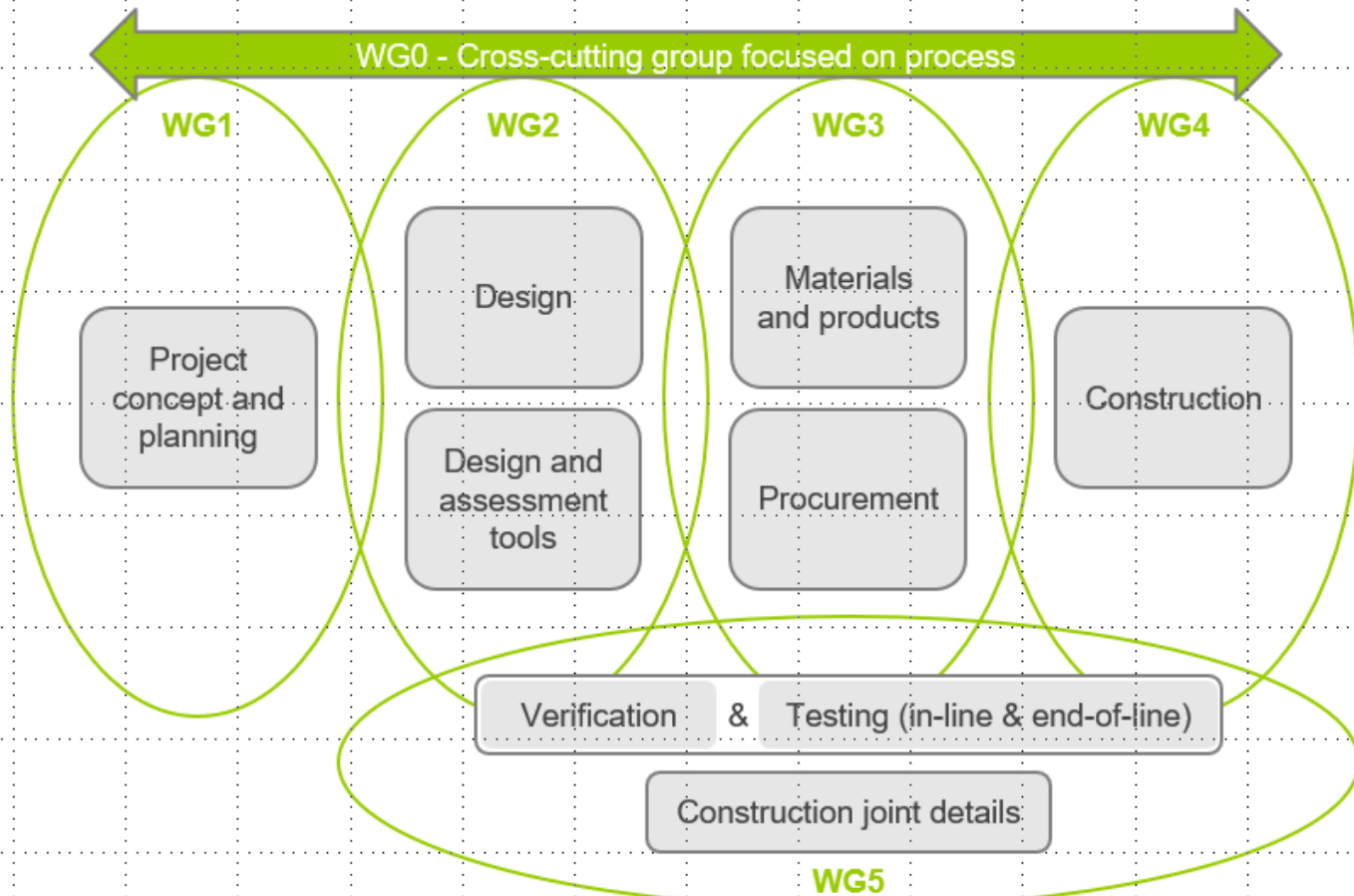
....not by a country mile !!



The Journey – Solutions !



Work Group interaction



The Performance Gap

Right industry 'We have a problem'
We need solutions !!!!

Government invests eqv.1million
\$NZ to solve the problem

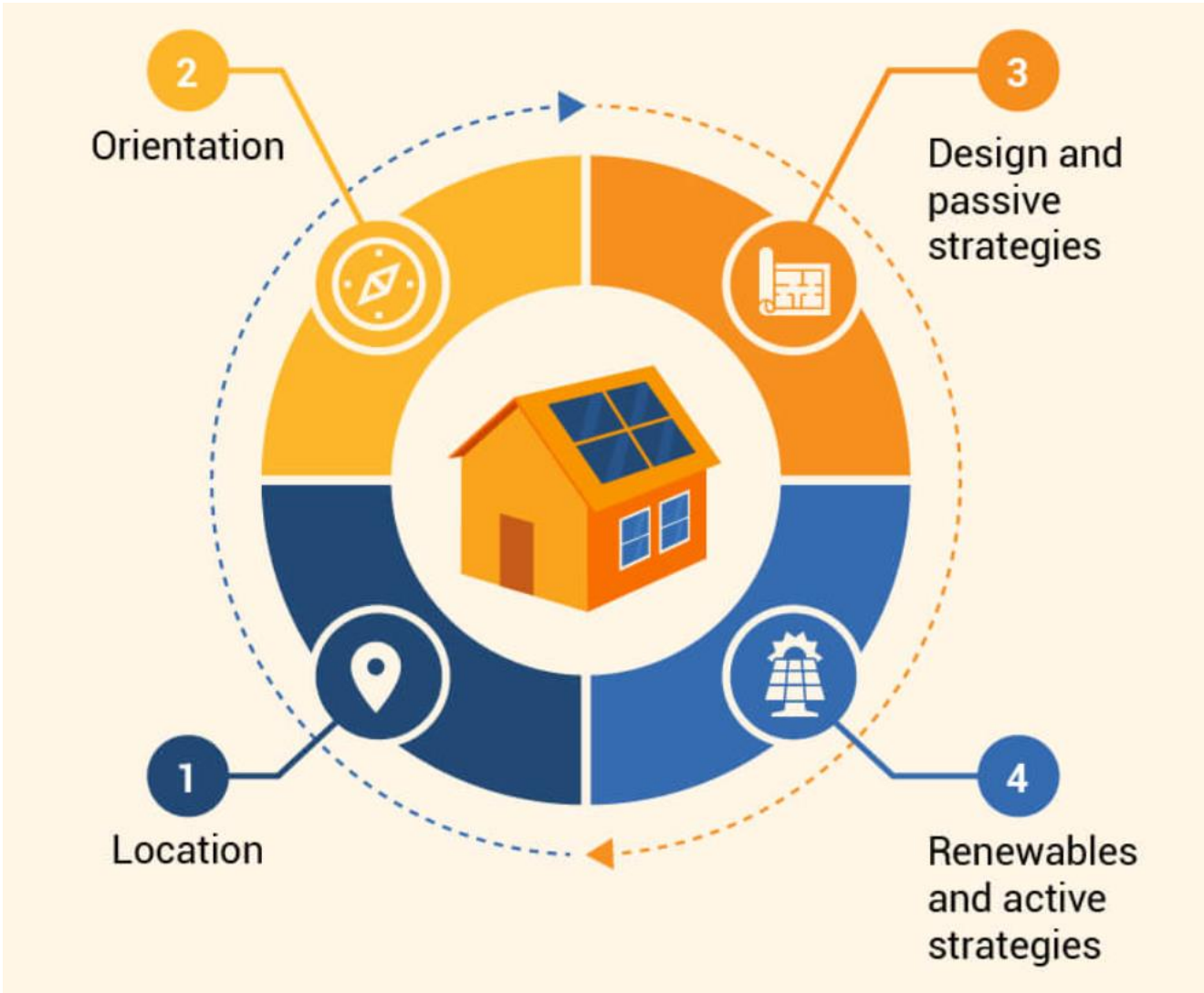
The key:

Industry CEO's leading the way

- **Reputation**
- **Share holder confidence**



The Journey – Problems & Solutions



Overheating

We are getting warmer so our buildings must accommodate this change.

80% of buildings constructed today will be still in existence in 2100

Don't forget humidity !!



The Journey – Problems & Solutions



Ventilation & Indoor Air Quality

Monitoring of internal environmental conditions to evaluate:

- Air quality and Comfort
- Temperature, relative humidity and CO₂ concentration in main living areas
- Evaluate propensity for mould growth, indoor air quality, health consequences
- Opening of windows to understand occupant behaviour with regard to comfort, air quality, internal temperatures and ventilation

Whatever ventilation strategy you plan to use

- Design it right
- Install it right
- Commission it right
- Use it right !!



Adobe Stock | 1298429068



The Journey – Problems & Solutions



Heat Pumps



VS

Gas Boilers



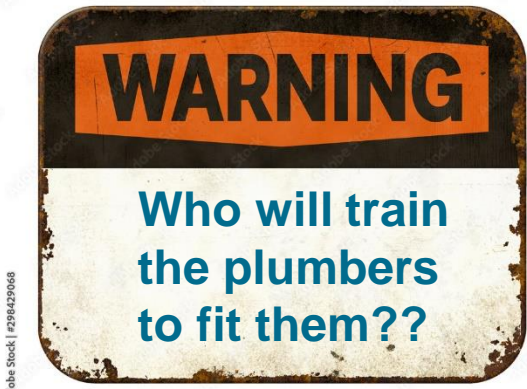
- More efficient
- Fueled by electricity
- Require outdoor space
- Eco-friendly
- Heating and cooling options
- Longer lifespan

- Less efficient
- Fueled by natural gas
- Require extra indoor space
- Produce carbon emissions
- Only heating options
- Shorter lifespan

As part of the government's Future Homes Standard, natural gas boilers will be **banned in new build homes from 2025**.

It will then be mandatory to fit low-carbon heating systems in new buildings, like heat pumps.

You can reduce the running costs of a heat pump by installing solar panels on the property.



The Journey – Communications



Communications were the key success

- Communicating with Government Ministers quarterly at the Zero Carbon 'Task Force'
- Communicating with Industry at a range of Forums and conferences each week
- Meeting CEO's of the Construction Industry regularly to ensure they were 'on-board'



The Journey – Summary



A few take aways

1. Was the introduction of the Zero Carbon Hub successful?

Immensely Government put a stake in the ground and said :
“Get together guys and deliver this objective of building
Zero Carbon Homes by 2016” and here is a \$million

2. Did construction costs go up?

No.

And the cost of living in a low energy, low carbon home went down
..... dramatically

3. Could New Zealand do this?

Yes !! Just needs Government to set the ambition, set the scene and set the journey

New Homes	New Non-Residential
Existing Homes	Existing Non-Residential

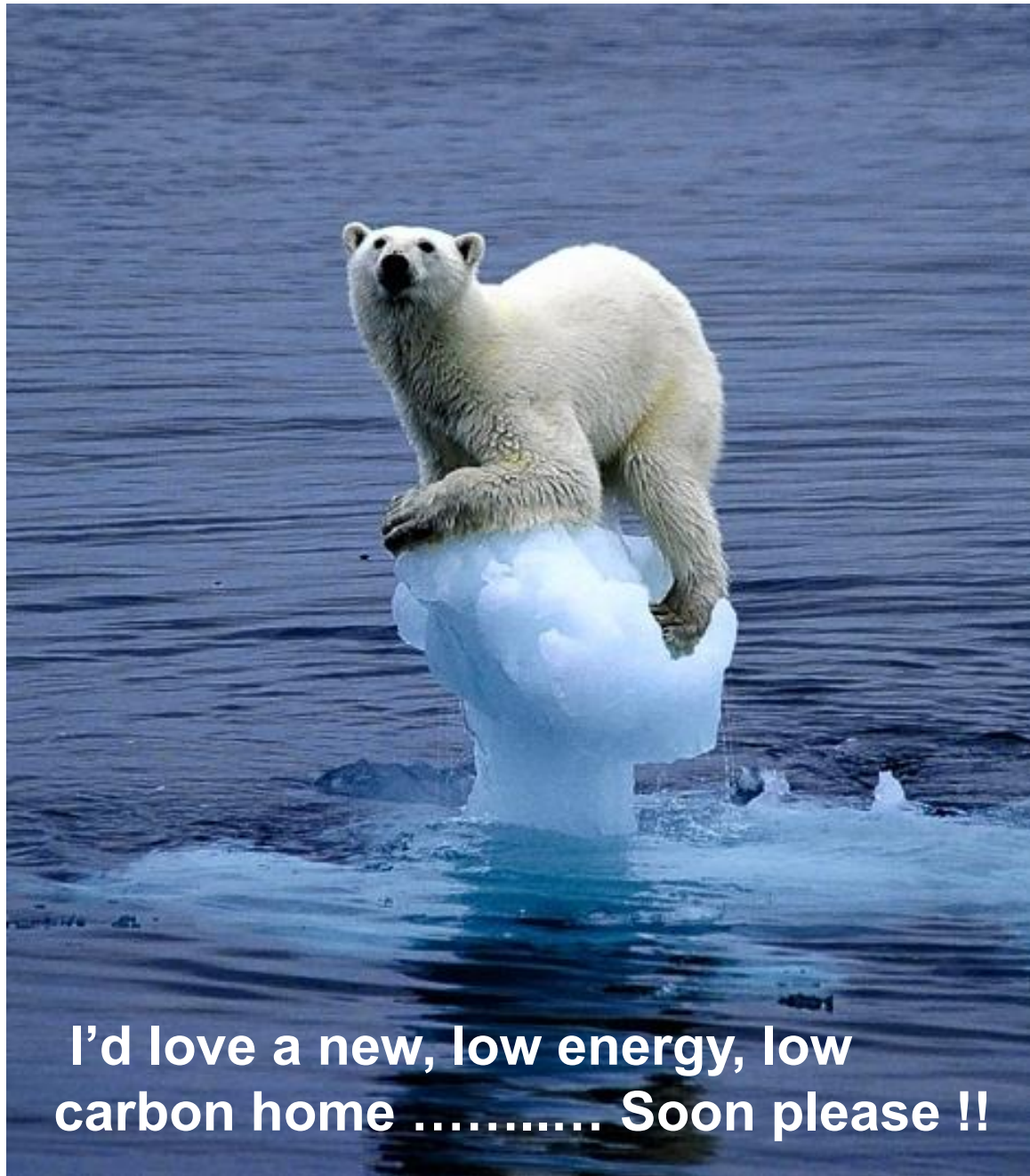


The Journey – The Occupant



Indicative costs and savings calculated using Zero Carbon Hub house types modelled in NHER Plan Assessor 5.3/5.4 (SAP2009) with projected energy costs taken from DECC published figures.





I'd love a new, low energy, low carbon home Soon please !!

Thank You !
Special thanks to Andrew and his
team at NZGBC

Further information:
Rob Pannell

Rob@thebuildingshub.co.uk

<https://www.thebuildingshub.co.uk>

