The Climate Emergency - The challenges and opportunities of retrofitting our existing stock

Homes Conference - 27 November 2019

John Milner and Joe Jackson, Baily Garner
Jon Warren, Energiesprong

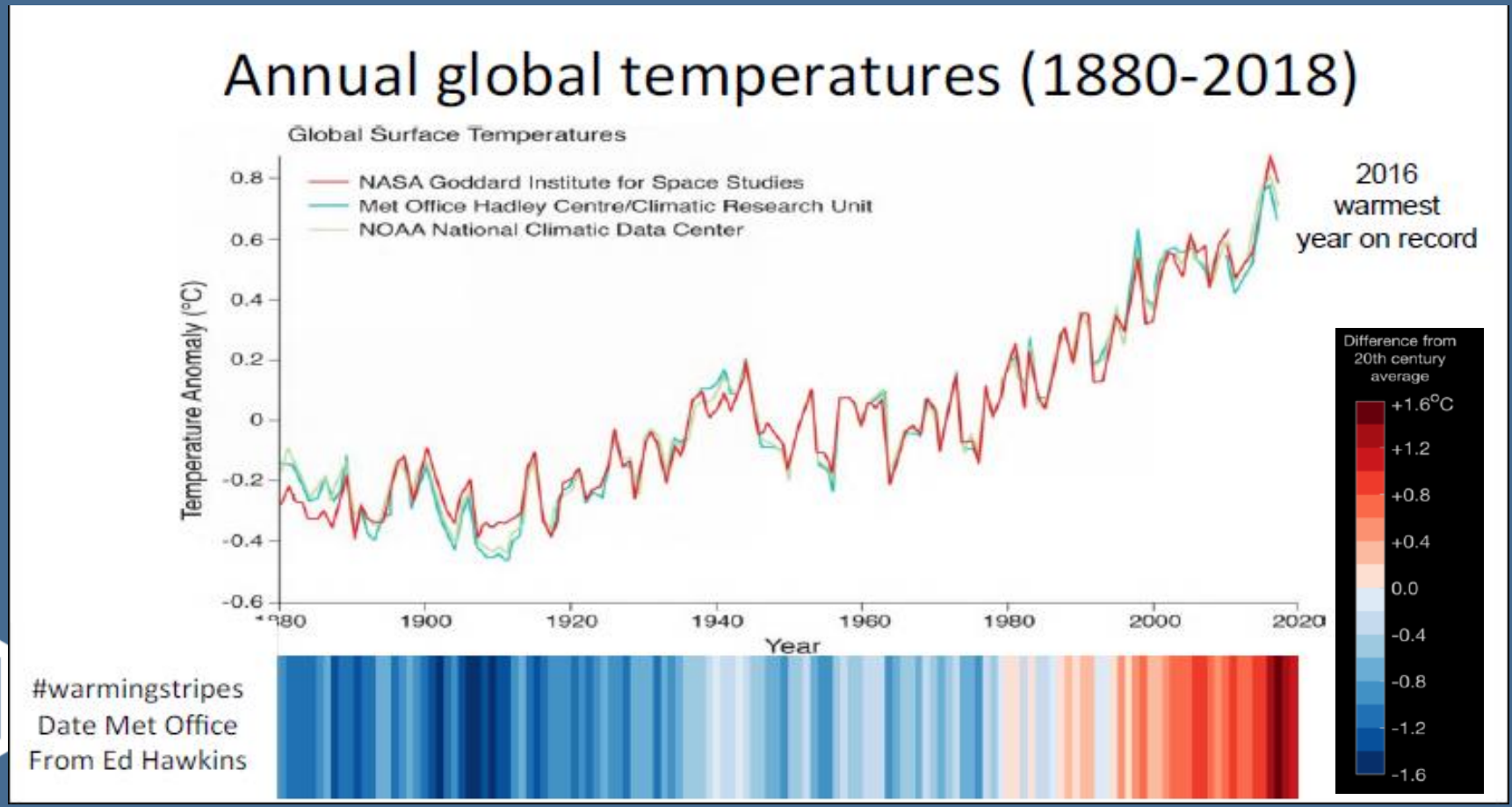
Contents

- Climate and Ecological Emergency
- Retrofit – How we got here
- Each Home Counts
- PAS 2035
- BG Case Studies
- Energiesprong – Creating the Market for Net Zero Refurbishment
- Questions and Answers

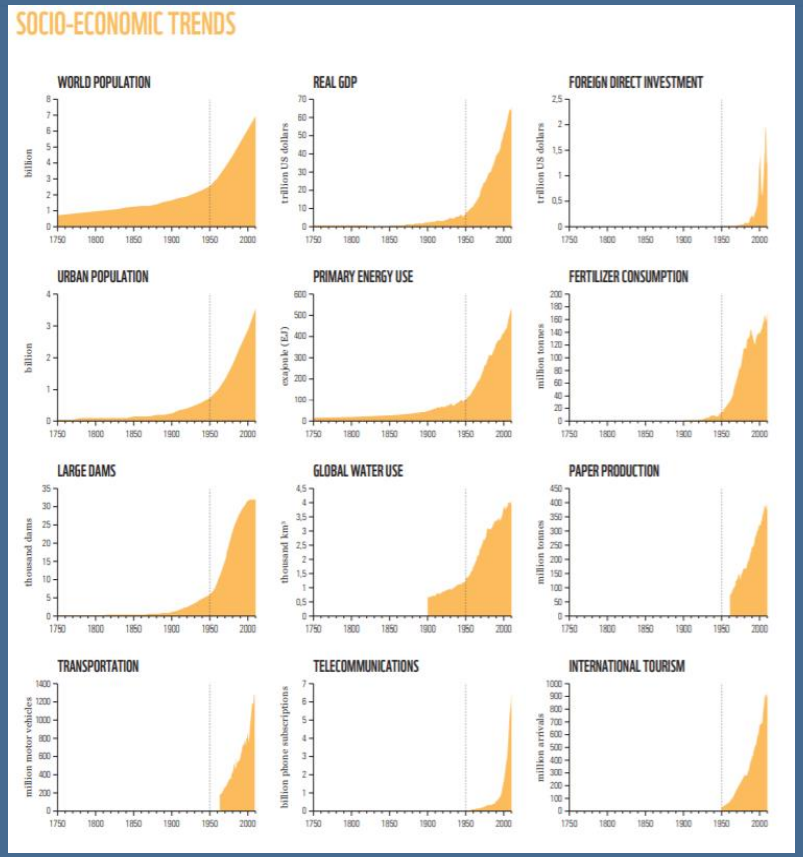
Climate and Ecological Emergency

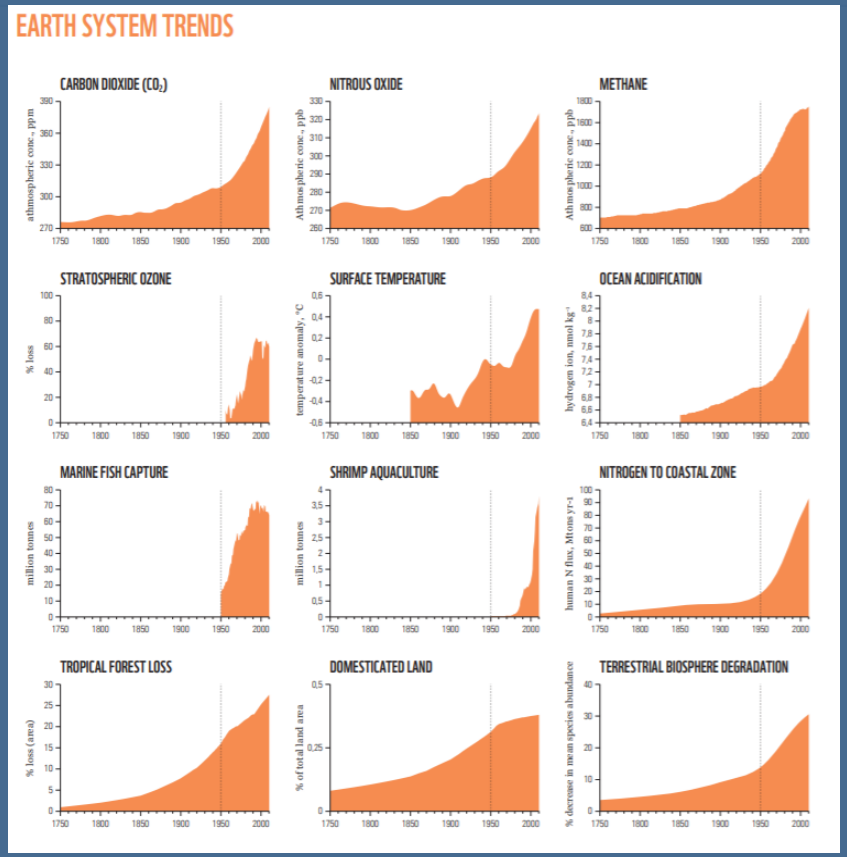
An **emergency** is a situation that poses an immediate risk to health, life, property, or environment. Most emergencies require urgent intervention to prevent a worsening of the situation, although in some situations, mitigation may not be possible and agencies may only be able to offer palliative care for the aftermath.

Climate Emergency



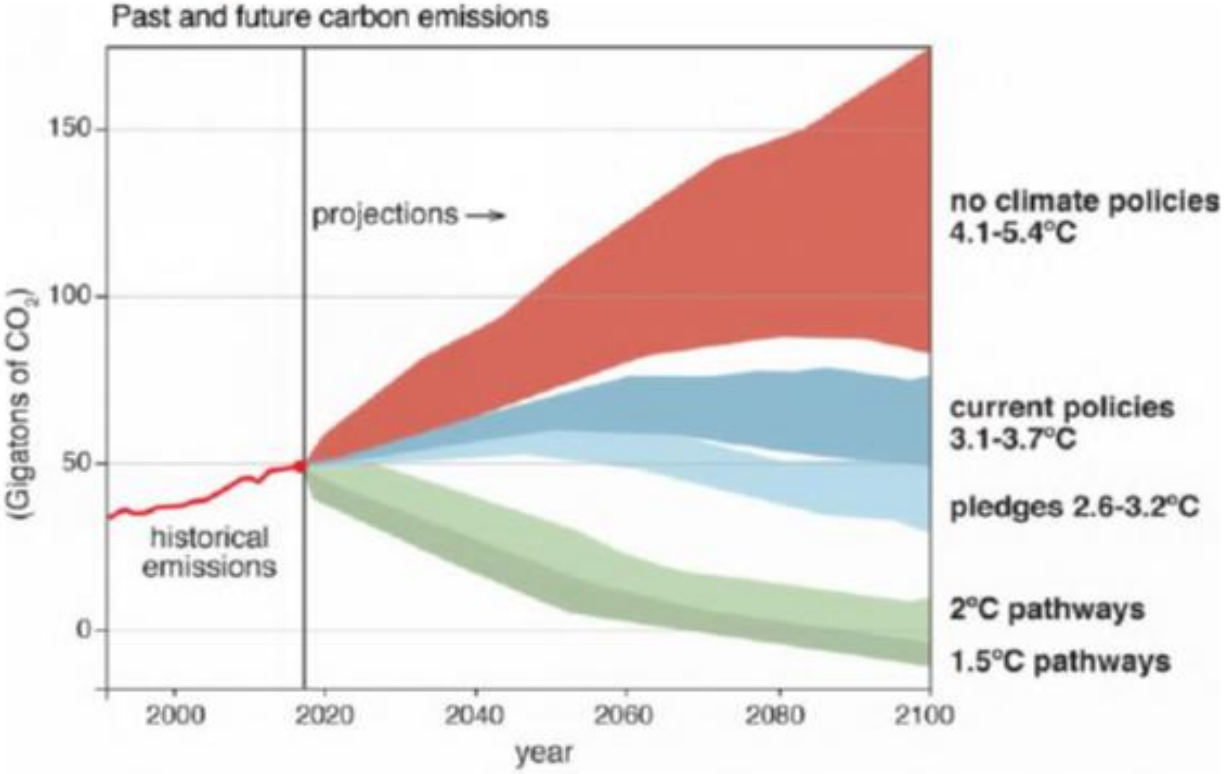
Ecological Emergency





The Evidence and the future

Future warming depends on our choice of carbon emissions



The Political Optics

For Refurbishment to play its part in Net Zero

- English Housing Survey 2017-18
- 24 Million Homes in total
  - 64% owner occupier 14.8m properties
  - 19% private sector rented 4.0m properties
  - 10% Housing Association 2.4m properties
  - 7% Local Authority 1.6m properties

- 1564 weeks between now and 2050

- 4m (HA & LA) homes ÷ 1564 = 2,557 homes per week

- Total Cost
  - Take your pick
  - Say average cost £25k
  - £63m per week
  - Circa £100 billion total

A Quick look at how we got here

Retrofit for the Future 2009-2014

- Expert review panel published data and report
- Few projects met target, typical retrofit cost £90K

The Green Deal

- Failed because of high interest rates, no promotion, under-funded assessments, no design, lack of trust
- Ministers' 'cowboy builders' paranoia led to PAS 2030

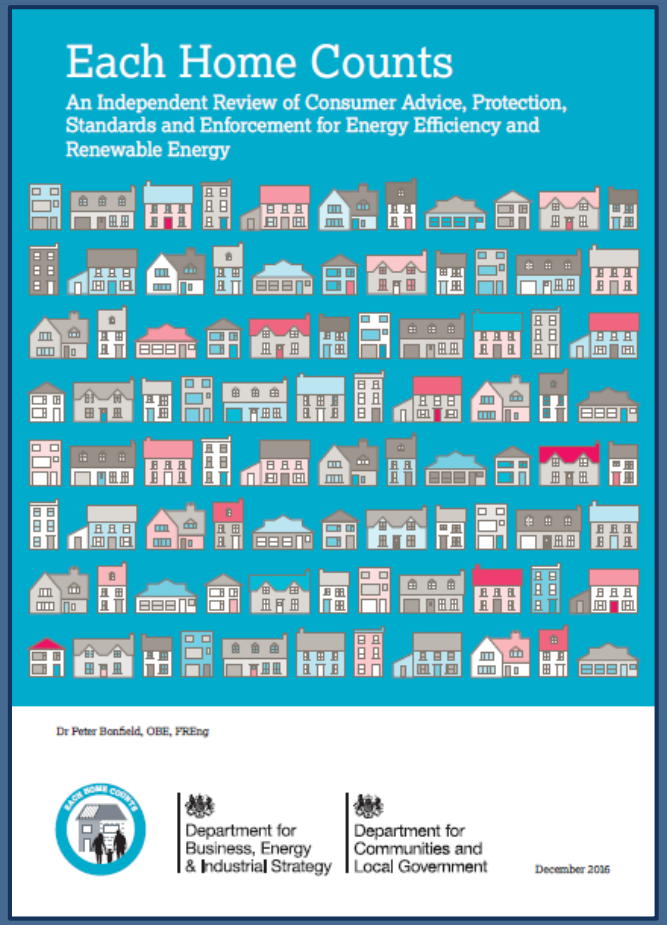
Energy Company Obligation (ECO)

- Measures based, installation compliant with PAS 2030

Centres of excellence

- The Centre of Refurbishment Excellence (CoRE), RE:NEW, Sustainable Traditional Buildings Alliance, UK Centre for Moisture in Buildings

Each Home Counts

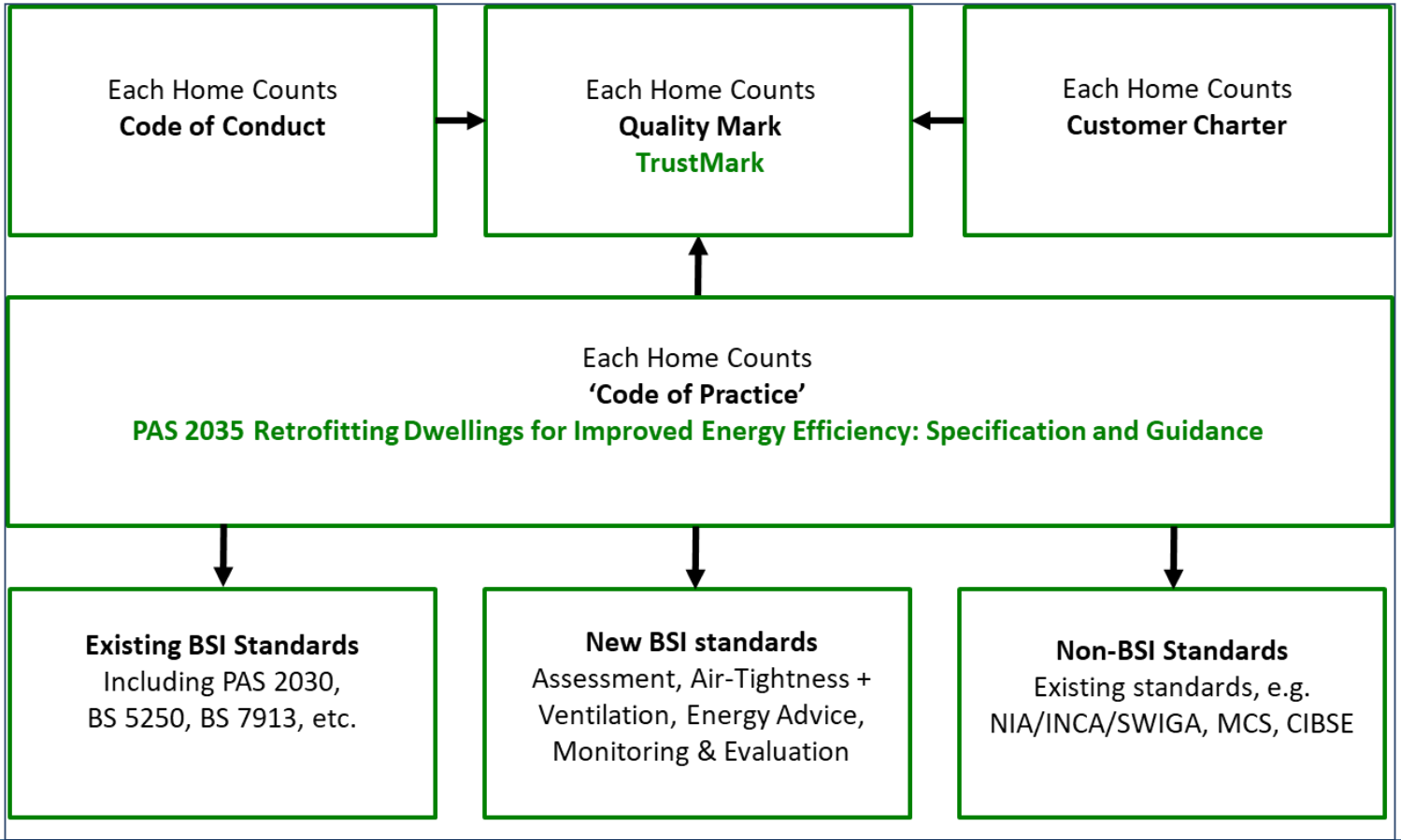


- **Followed Failure of Green Deal. Published in Dec 2016**
- **Industry-led review**
- **Twenty-seven recommendations**
- **Implementation by industry and BEIS**
- **Two strategic objectives**
  - Boost demand for energy efficiency from consumers and the public sector by restoring trust in the industry
  - Reduce risks to finance bodies to encourage funding
- **Establishes a framework to support the market**

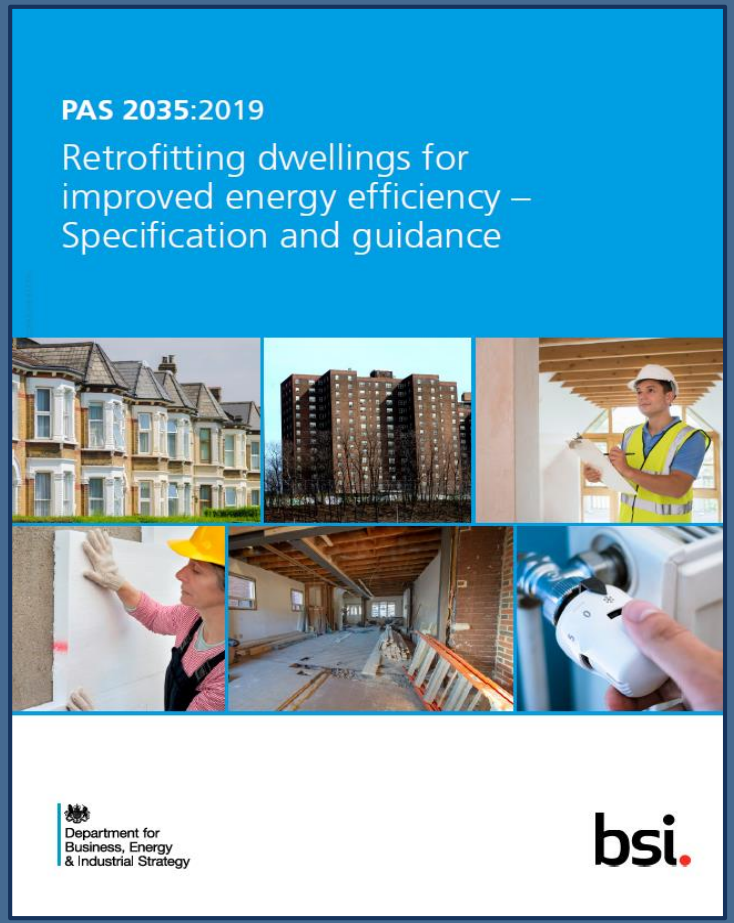
TrustMark

- Government owned and endorsed
- Adopted as the Each Home Counts Quality Mark
  - Working alongside MCS (for renewables)
- Retrofit members must adhere to
  - Customer Charter and Code of Conduct
- ECO installers must become members of TrustMark
  - Membership is via their Certification Bodies
- TrustMark and Ofgem require ECO installers to
  - Comply with PAS 2030: 2017 (now)
  - Comply with PAS 2035: 2019 (by January 2021)

BSI Retrofit Standards Framework



PAS 2035 – JUNE 2019



- Any domestic Retrofit - Not just Eco
- Used in conjunction with other standards including PAS 2030
- New Roles – Every project has a Retrofit Coordinator
- Whole house risk based approach
- Proposal for mandatory publically funded schemes compliance (Jan 2021?)

Key Points

- Five new roles including Retrofit Coordinator – Central role responsible for any project beginning to end, including claiming compliance with PAS 2035.
- Other roles for Retrofit Advisors, Assessors, Designers and Evaluators.
- The Retrofit Coordinator is required to establish the outcomes with the client and ensure an ‘in depth assessment’ starting point
- Level of qualifications required dependent upon assessed risk
- Level of assessed risk determines the path through the PAS 2035 process
- The risk assessed as A, B, C dependent on triage process and inputting information into a risk assessment template

Key Points

The five **risk** criteria are:-

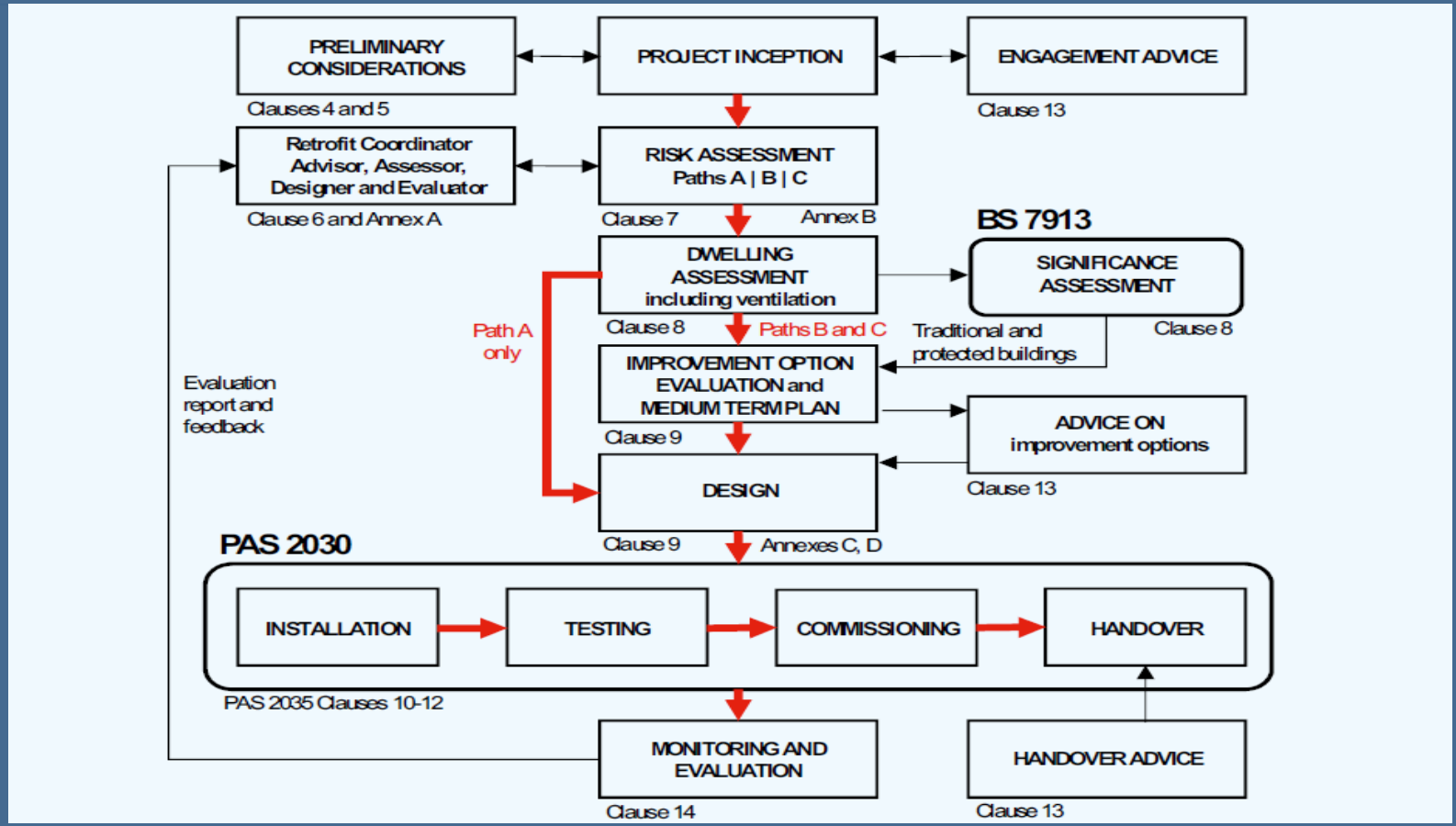
- Number of dwellings to be improved
- Number of required per dwelling
- Measures proposed
- Combination of Measures
- Constraints of built form

Path A – Simple Requirement which allows single measure installation by specialists

Path B and C - More onerous requiring an improvement option evaluation and a medium term improvement plan identifying a 20-30 year plan for improvement

Path C – Specification more onerous and requires specialist input

Overview of the PAS 2035 Retrofit Process

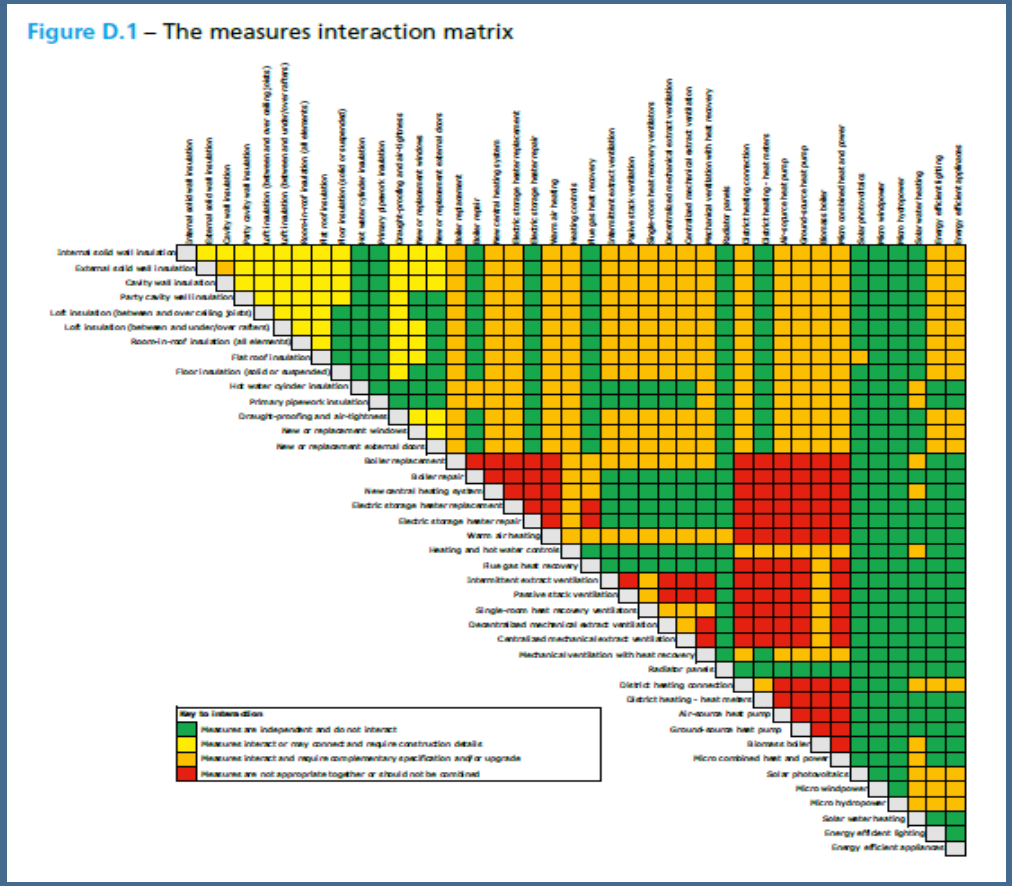


Key Points

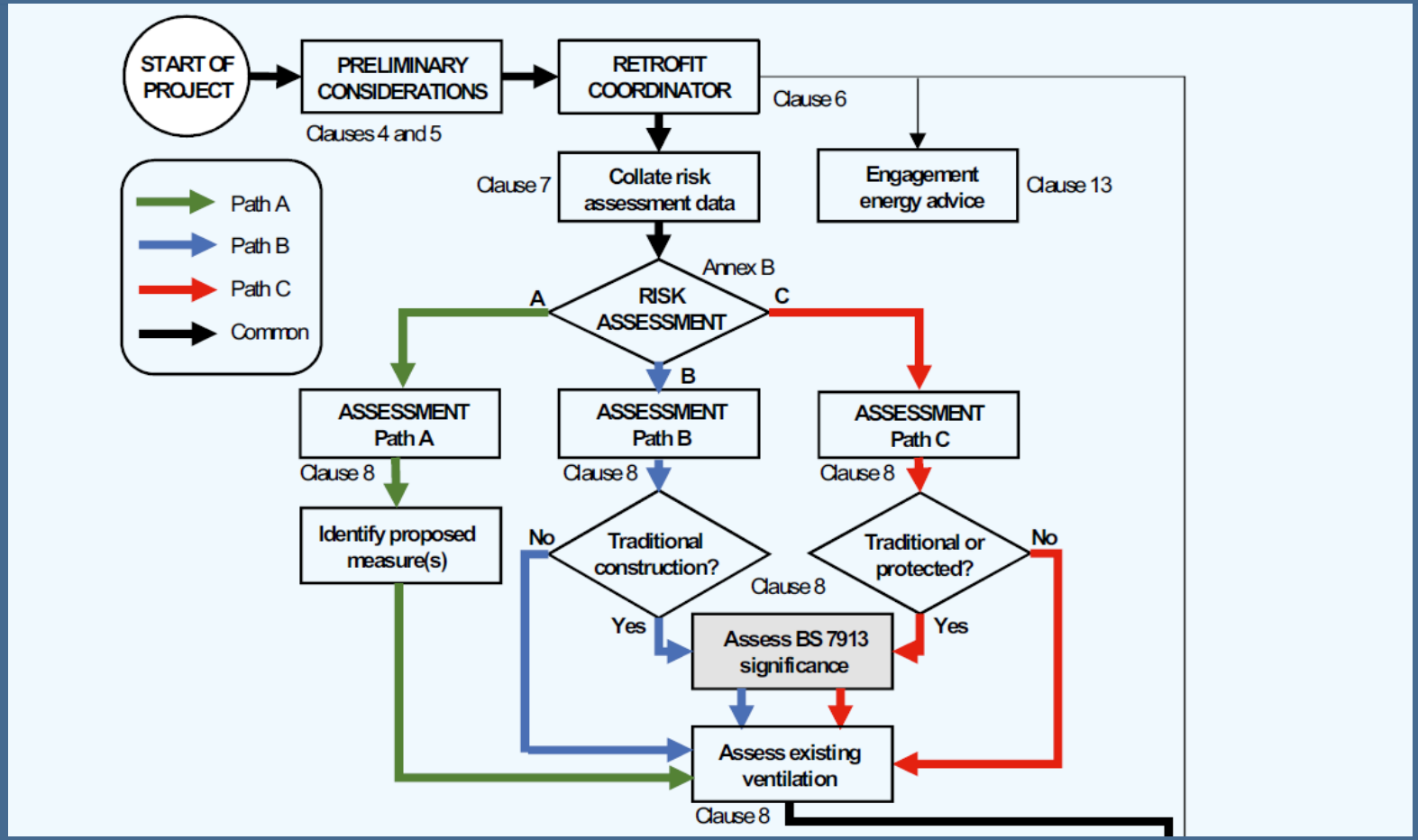
- PAS 2035 – Appendix C deals with ventilation dealing with assessment of whether ventilation is inadequate and requires upgrade
- Design will depend upon risk but in every case must consider agreed outcomes
- Must Consider: planning and building regulations, moisture, interfaces, ventilation, testing commissioning etc
- Measures Interaction Matrix
  - Used in risk assessment (inherent and combined risks)
  - Identifies where retrofit design must consider interfaces
- Commissioning and handover – Soft landings
- Monitoring and evaluation
  - Confirms agreed outcomes, investigates discrepancies

Measures Interaction Matrix

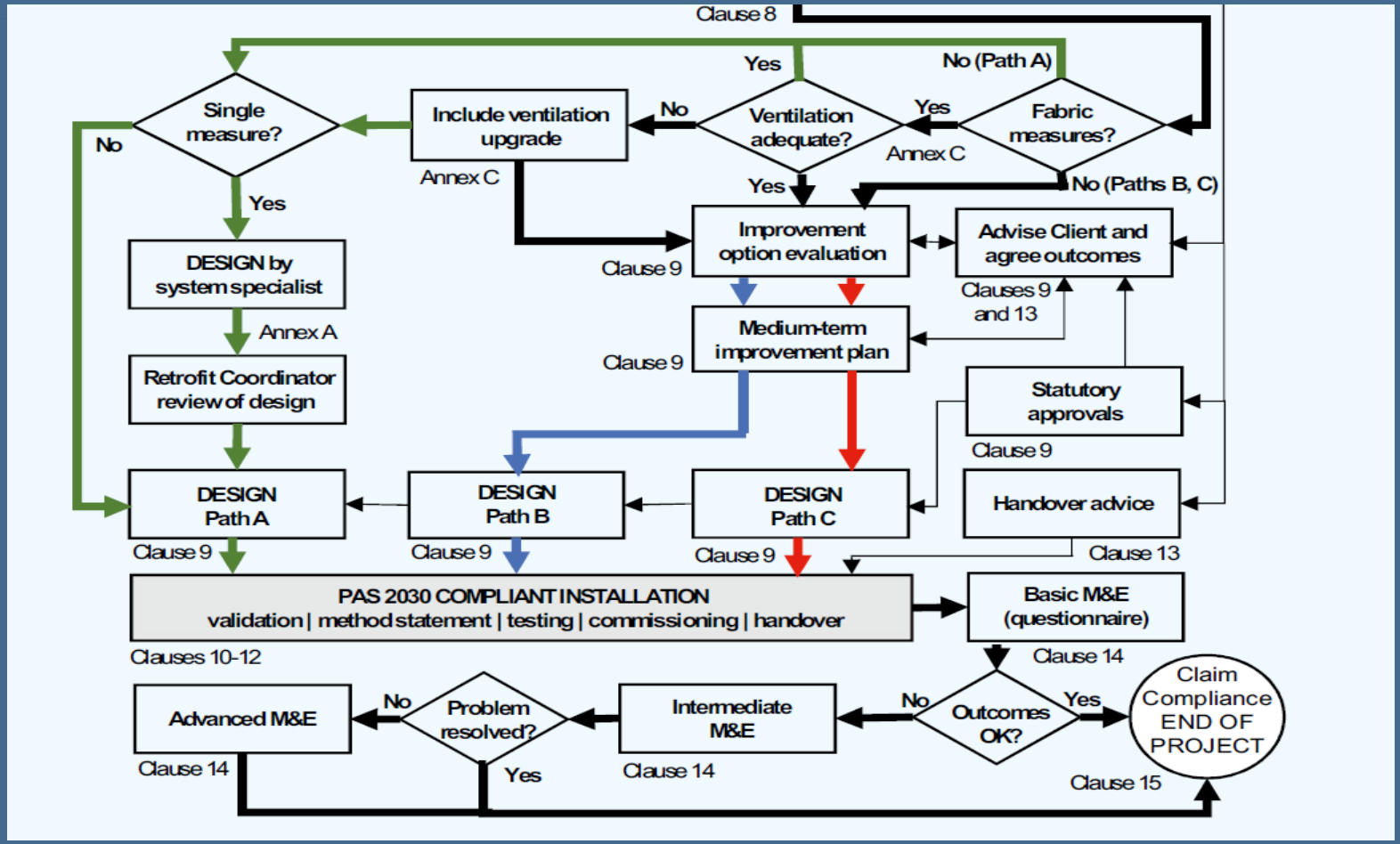
Figure D.1 – The measures interaction matrix



PAS 2035 Retrofit Process



PAS 2035 Retrofit Process



Some Conclusions

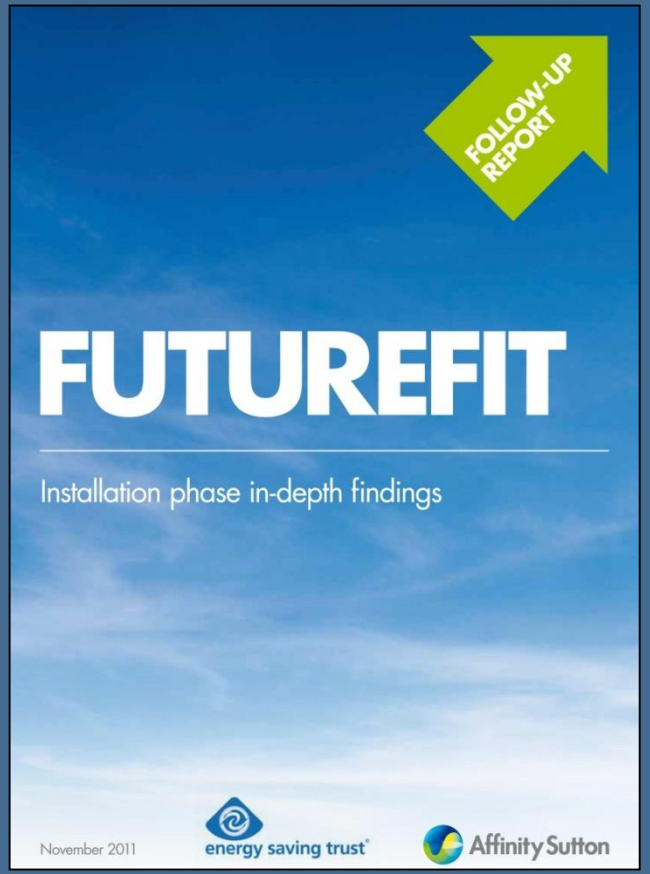
- The bigger but harder wins are in the private sector
- Trying to put right what went wrong with Green Deal
- Quality and Assurance is key and Government supports this
- Standard is thought to become mandatory for publically funded projects
- Process looks complex for some single measures eg boilers but……
- New Homes Standard has promised an existing homes consultation due out shortly

Case Studies

- Futurefit – Affinity Sutton
- Sutton Investment Options Appraisal
- Risks in Retrofit
- Energiesprong

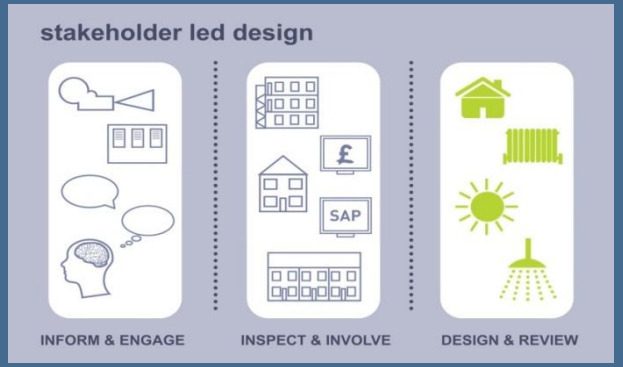
energie sprong uk

Futurefit – Affinity Sutton



Futurefit – Affinity Sutton

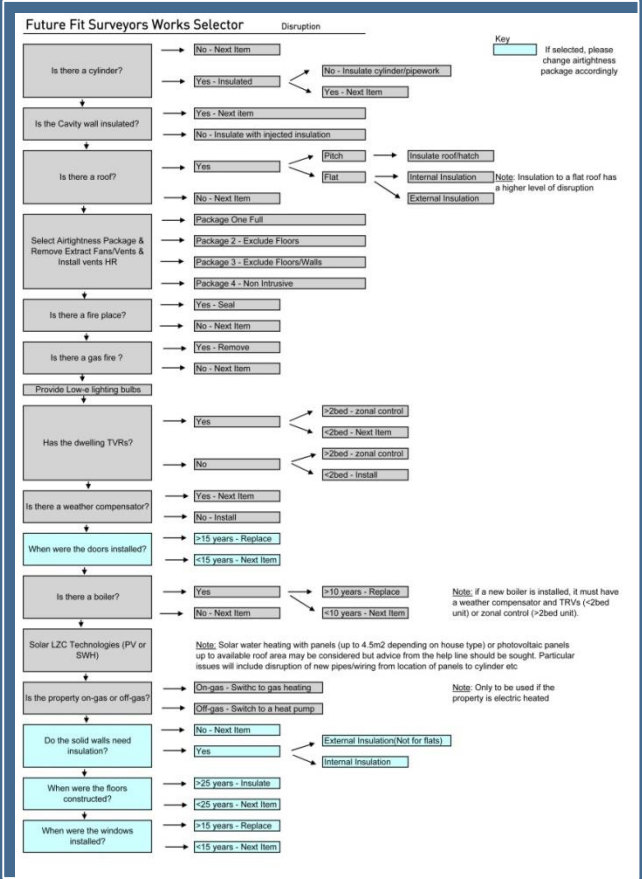
- Low Carbon Retrofit Programme
- 102 Properties
- Energy Efficiency Improvement & Carbon Emissions Reduction
- Project Budget £1.2m
- SAP Driven
- Stakeholder Driven
- Post Installation Monitoring
- Green Deal



Futurefit - Archetype Selection

Property type	Built form	Wall Construction type	Pre 1900	1900-1929	1930-1949	1950-1966	1967-1975	1976-1982	1983-1990	1991-1995	1996-2002	2003-2006	2007 onwards	Unknown	Grand Total
Bungalow	Detached	Cavity			1	7	17	3	3	10	11	3		3	58
		Solid brick		1					3						4
	End-terrace	Cavity		1	1	130	49	51	15	4	9	2	6	22	290
		Timber frame										1			1
	Mid-terrace	Cavity			14	169	57	74	26	4	4	25		16	389
		System built				4									4
		Timber frame										1			1
	Semi-detached	Cavity		2	19	49	61	18	9	12	82	32	28	37	349
		Solid brick												1	1
Flat	(blank)	Cavity		1297	1056	3403	1215	1639	557	422	894	594	977	651	12705
		Solid brick	5	101	56	263	23		3	11	23	4		29	518
		Timber frame					4	16	2	30	4	2	9	7	74
House	Detached	Cavity		2	5	7	22	6	8	20	10	4	2	8	94
		Solid brick		27	3								4		34
	End-terrace	Cavity	6	1329	2285	1862	487	643	370	1193	1594	337	513	772	11391
		Solid brick	1	572	256	167	5	0	4	0	3	1	118	53	1180
		System built	0	0	180	50	17	0	0	0	0	0	1	0	248
		Timber frame	0	0	0	4	39	92	4	42	46	4	0	31	262
	Mid-terrace	Cavity	2	557	1797	1315	620	826	282	350	505	147	18	390	6809
		Solid brick	7	228	82	132	6		5		24		71		555
		Stone		1			1						1		3
		System built				19	16				8				43
		Timber frame				15	107	253	20	8	2	6		61	472
		(blank)											1		1
Maisonette	(blank)	Cavity		30	85	815	1090	515	52	9	29	37	10	96	2768
		Solid brick		82		17	110				5				214
		Timber frame					1					8		3	12
(blank)	(blank)	Cavity												3	3
		(blank)		3		1	8	4	7			5	215	3	246
Grand Total			21	4233	5840	8429	3955	4140	1370	2115	3253	1213	1974	2186	38729

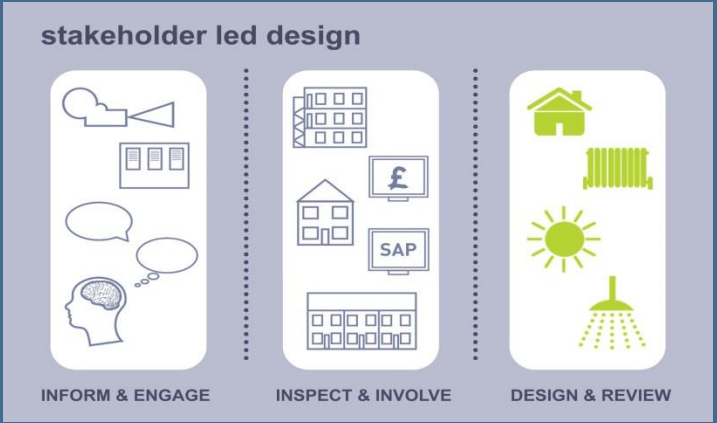
Futurefit - Works Selector



- **Packages Designed to:**

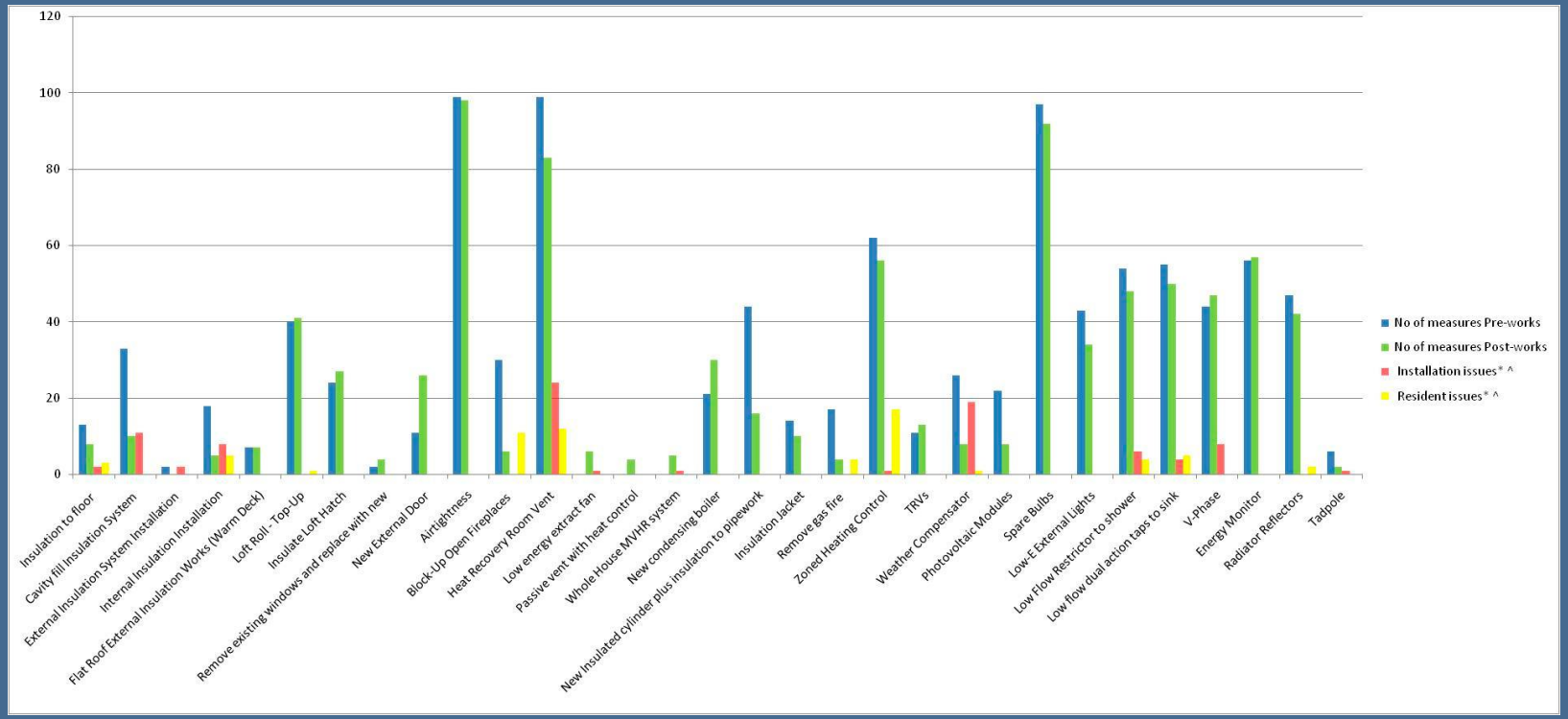
- Maximise carbon savings over lifetime
- Follow energy hierarchy
- Avoid decanting
- Achieve best value SAP/carbon/fuel improvements

Futurefit – Stakeholder Led Design



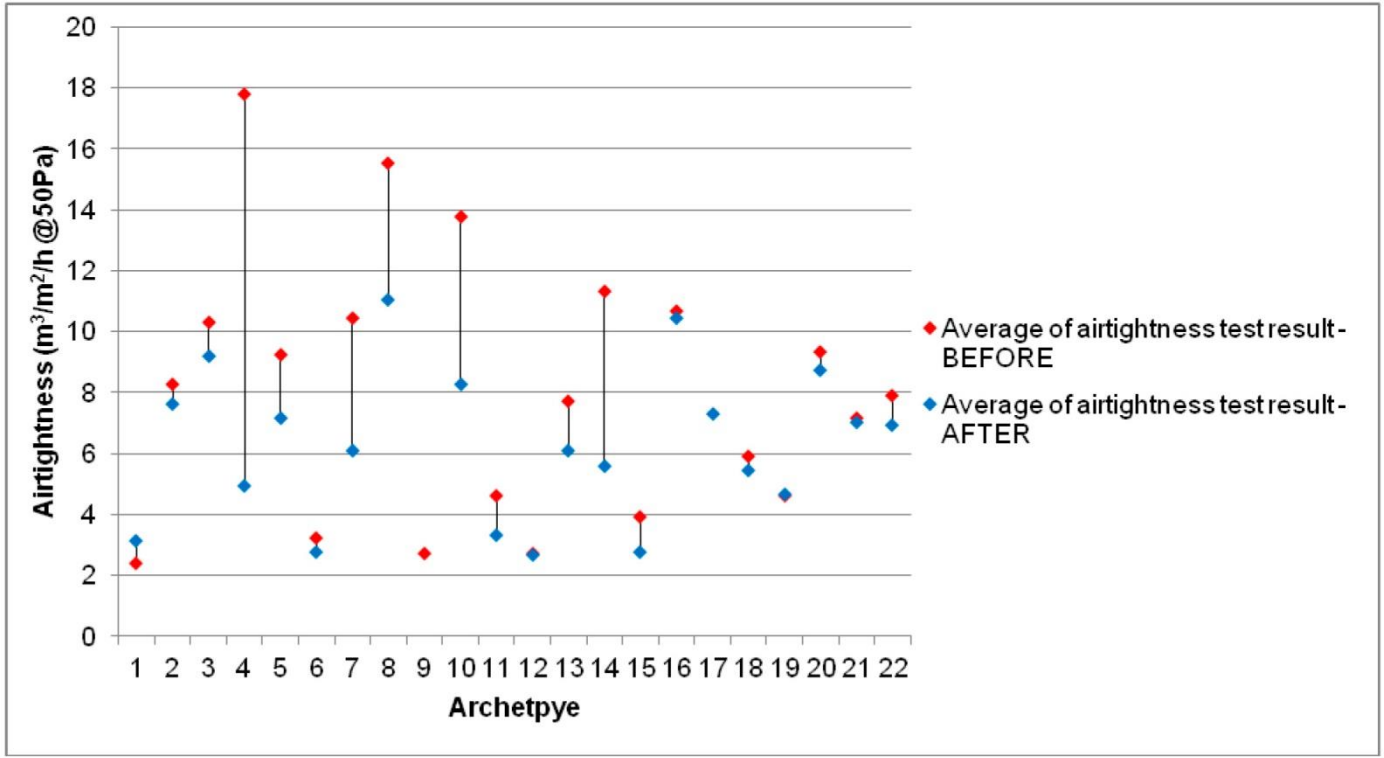
- Residents
- ASG surveyors
- ASG supply chain
- ASG project manager
- Contractors' RLOs
- Stakeholder led design
- Energy Savings Trust

Futurefit – Installations and Issues



Futurefit – Air Tightness

Figure 6: Average fabric airtightness pre and post works



Futurefit – Findings

- SAP is imperfect
- Archetype/asset, management approach only goes so far
- Supply chain and client teams need support
- Stakeholder led design worked
- Some straight forward measures more difficult than thought
- Air tightness very variable and strategy required for measures and ventilation
- Costs increased over Energy Savings Trust model
- Ultimately the Golden Rule was not reached

Sutton Housing Partnership

- Investment Options Appraisal
- 66 Unity Homes of non-traditional construction
- Limited or restricted mortgage potential – ‘Right to Buy’ issue
- Notoriously difficult to upgrade

SHP – Stages of Intervention

- Just in Time / Reactive Maintenance Approach
- Planned Maintenance – Elemental Replacement and Repairs
- Regeneration / New Build to Current Regulations
- Whole House Approach – Modern Technologies

SHP – Surveying and Modelling

The results of E

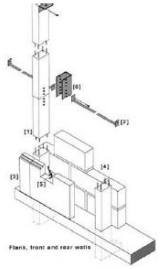
#	Variant	
1	Baseline	N
2	Traditional	E
3	Trad +	E
4	Electric	A
5	Electric +	A
6	Electric +	A
7	Electric ++	A
8	Energiesprong	E
9	Energiesprong	E

(a)
(b)
(c)
(d)
(e)

7.7 Coulsdon Study A

Existing Schedule	
Type	
A	House
Proposed Schedu	
SITE AREA DENSITY	
Type	
A	3 BED/6P House
	TOTALS
Car Parking Notes	
Parking Standard for Dwellir	
3 Beds – provision of maxim	
Provision the maximum stan	
Proposed Parking for Dwelli	
100% for houses = 40 spaces	
*Note 1 'Buyback required'	

Decarbonised heat scenario using a Hydrogen gas grid (illustration assumes +50% increase in cost compared with natural gas, H21 Consortium (2016) Leeds City Gate suggests 100% cost / kWh increase but with the opportunity for cost savings)



Flank, front and rear walls

CONSTRUCTION

VARIANTS

3.2.4 Unity House Type 2

Floors
The ground floor is of solid concrete construction having splayed timber insets to which is fixed T&G boarding.
The first floor consist of suspended timber joists supported on steel beams and plates finished with T&G boarding

Roof
The roof is of timber framed pitched construction connected to the column heads with steel plates. The slopes are covered with interlocking concrete tiles with a lining of asbestos cement sheets.

Windows
Single glazed metal framed casements with pre cast concrete sill and head are fixed between the columns. For double width windows the columns are exposed as mullions.

Typical Defects associated with Unity Houses are:

- Longitudinal cracking of PRC columns
- Cracking and spalling of PRC lintels
- Corrosion of copper fixings to cladding
- Corrosion of Steelwork at interface between PRC columns and RSJ first floor beams
- Significant levels of chloride in PRC Panels
- Asbestos Cement roofing sheets

3.2.5 Typical Unity details

Cross section through columns

Bracing detail between columns

Corner bracing detail

SHP – Risks of Single Measure Upgrades

- Lack of Ventilation
- Condensation Issues & Black Mould
- Cold Spots from Poorly Installed Cavity Insulation
- Penetrative Damp
- Roof Space Issues
- New Windows without Ventilation

SHP – New Build / Regeneration

Factor	Option 1 - Planned Maintenance incl. "just in time"	Score	Option 2 – Refurbishment & Improvements	Score	Option 3 – Demolition and Re-construction as existing	Score	Option 4 – New Build	Score
Financial	Moderate	4	Moderate	5	Negative	2	Negative	2
Political - Resident Objections	Moderate	5	Moderate	5	Negative	3	Negative	2
Planning and Statutory consents	Positive	8	Moderate	6	Negative	3	Negative	2
Resident Engagement / Consultation Process	Negative	3	Negative	3	Negative	3	Highly negative	1
Energy Performance	Highly negative	1	Positive	8	Highly positive	9	Highly positive	9
Time / Programme	Negative	3	Moderate	4	Negative	3	Negative	2
Legal	Positive	8	Positive	8	Negative	3	Highly negative	1
Technical Complexity	Negative	3	Negative	3	Negative	3	Positive	8
Disruption	Negative	2	Negative	2	Negative	3	Negative	2
Scores out of 90		37/90		44/90		36/90		29/90
Percentage		41%		49%		37%		32%

SHP – Whole House Approach - Energiesprong

Energiesprong – A Whole House Approach

Realised to Date

- 17 UK
- 5,000 Netherlands
- 26 France
- 0 Germany
- 0 Italy

Planned

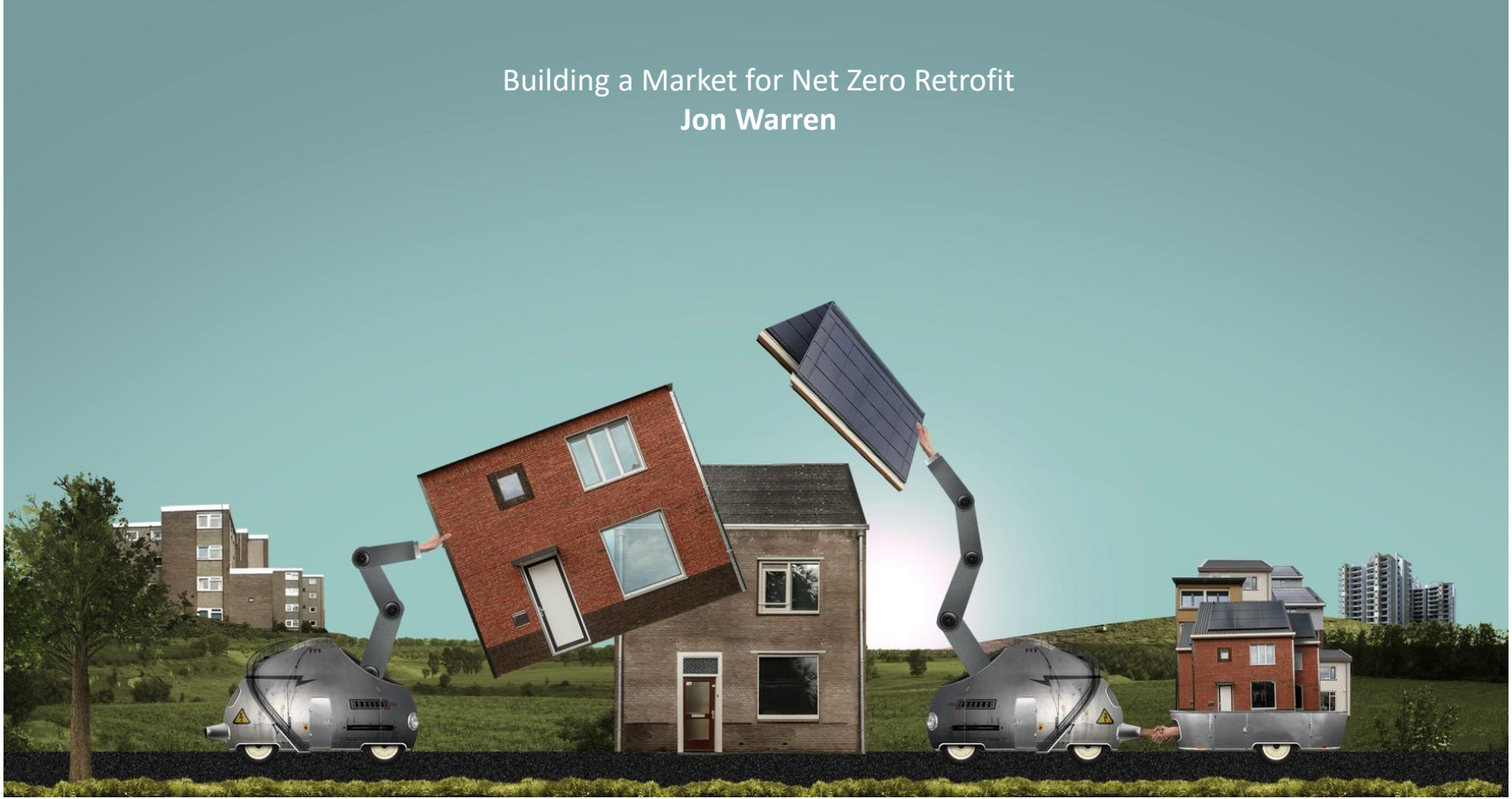
- 225 UK
- 14,400 Netherlands
- 6,550 France
- 105 Germany
- 5 Italy

Some Conclusions from Case Studies

- PAS 2035 aligns and supports the holistic approach
- Mandated Ventilation & Post Occupancy Checks are a must
- Whole house approach is preferable
- If funding is restricted, the assessment should be taken as a whole house approach and major elements upgraded
- There is not a ‘Silver Bullet’ approach to asset management
- Accurate and up to date stock data is key
- Resident lead design works in practice

Building a Market for Net Zero Retrofit

Jon Warren



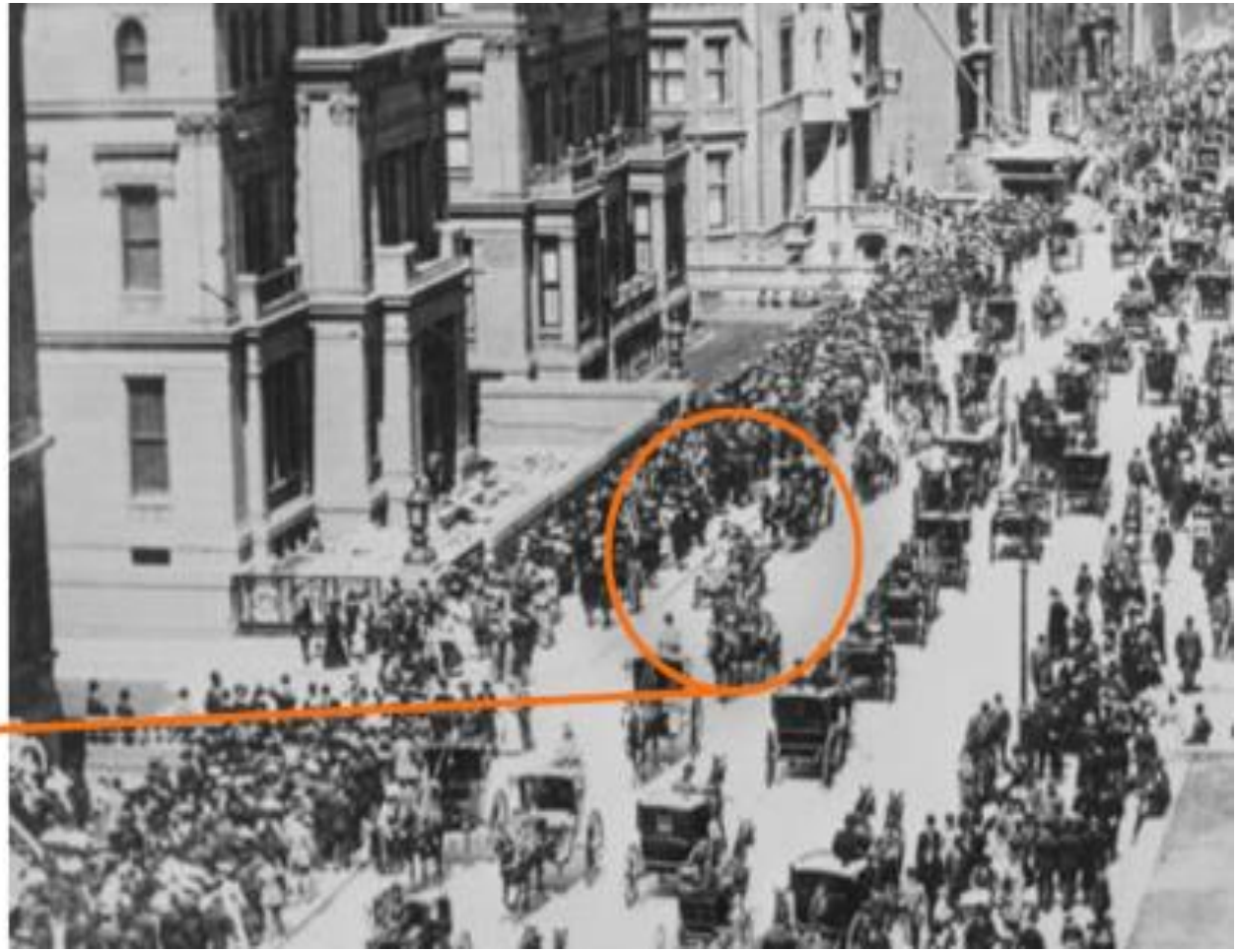
Interreg North-West Europe Mustbe0

EnergieSprong

5th AVE NYC

1900

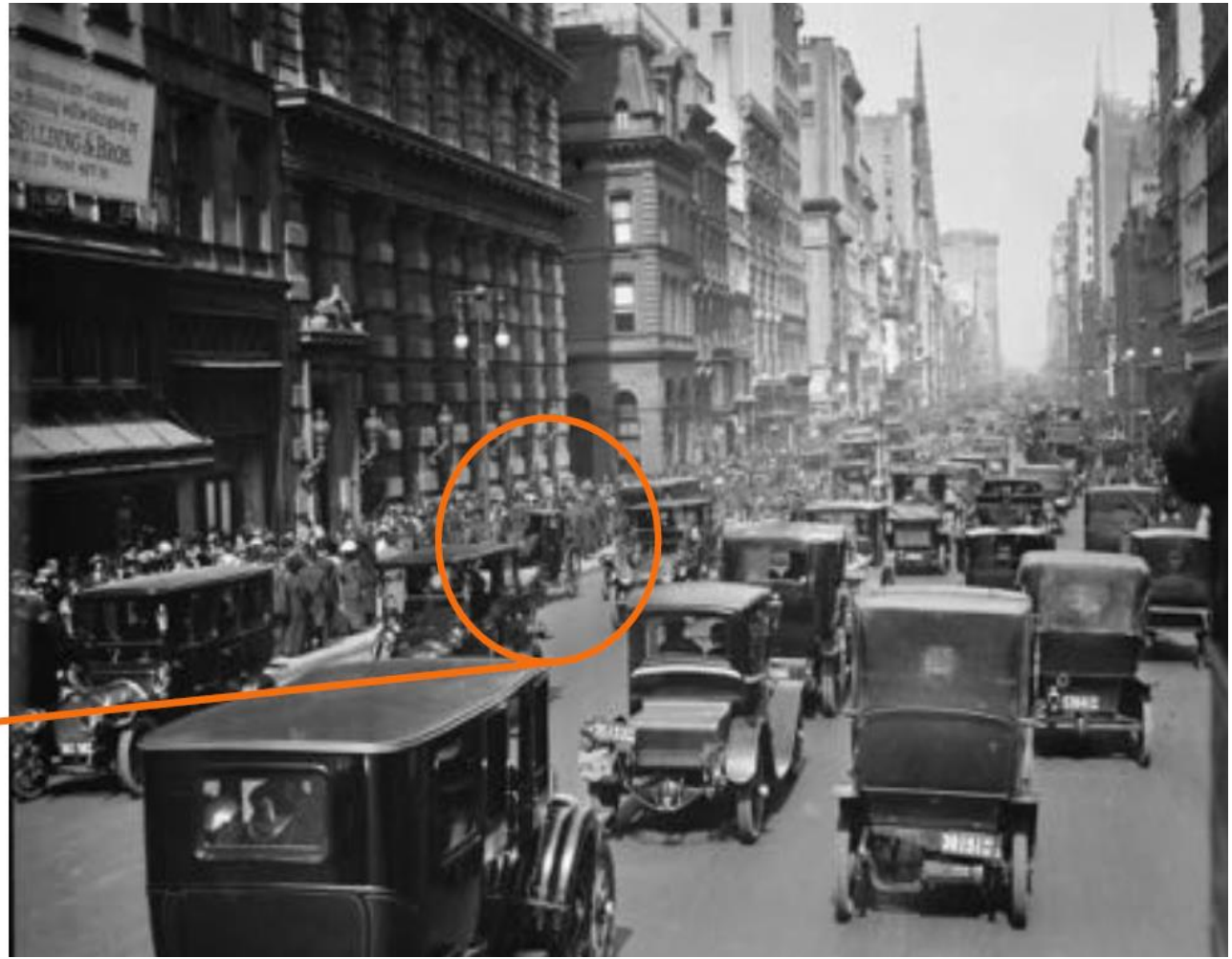
Where is **the car?**



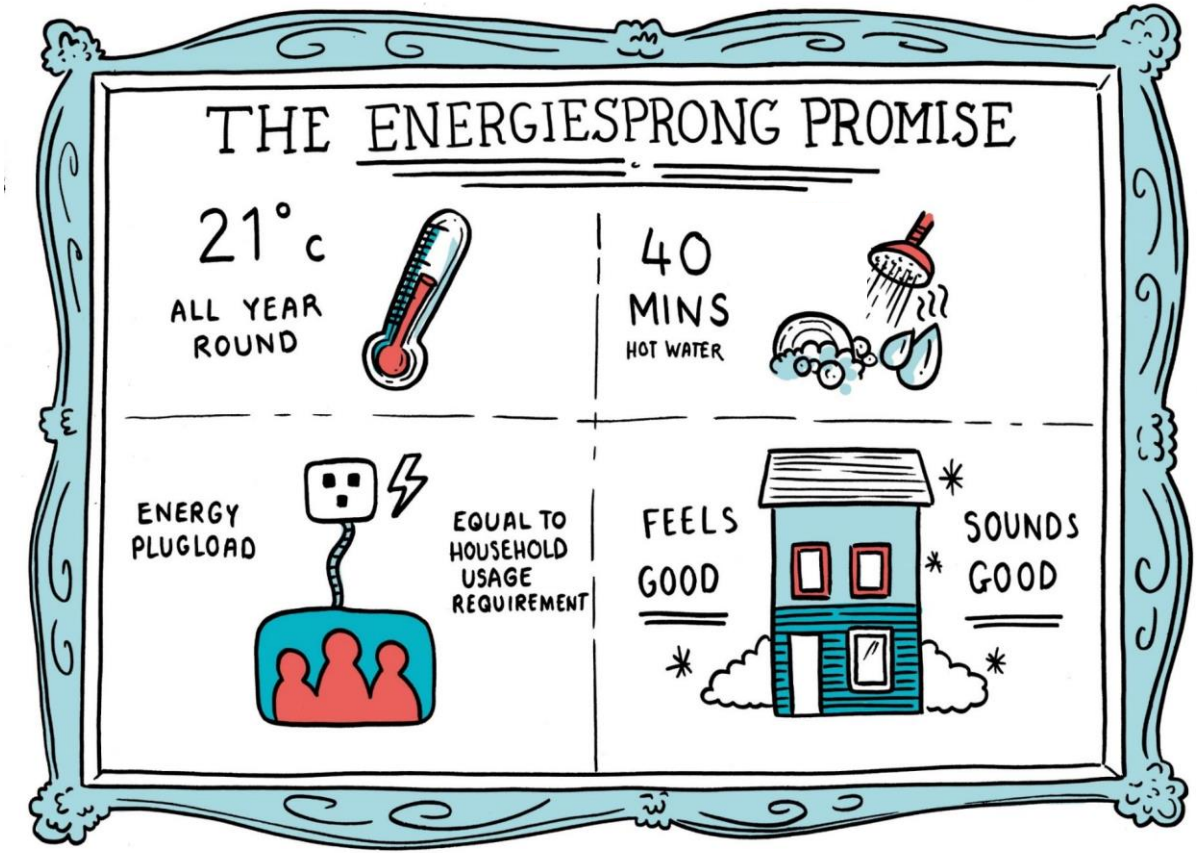
5th AVE NYC

1913

Where is the horse?




> An old home that’s better than a new home
> Warm and comfortable every day
> Affordable energy & maintenance – financed by guaranteed savings
> Factory built with a warranty, performs today and for 2050
> Net zero energy, (nearly) zero emissions

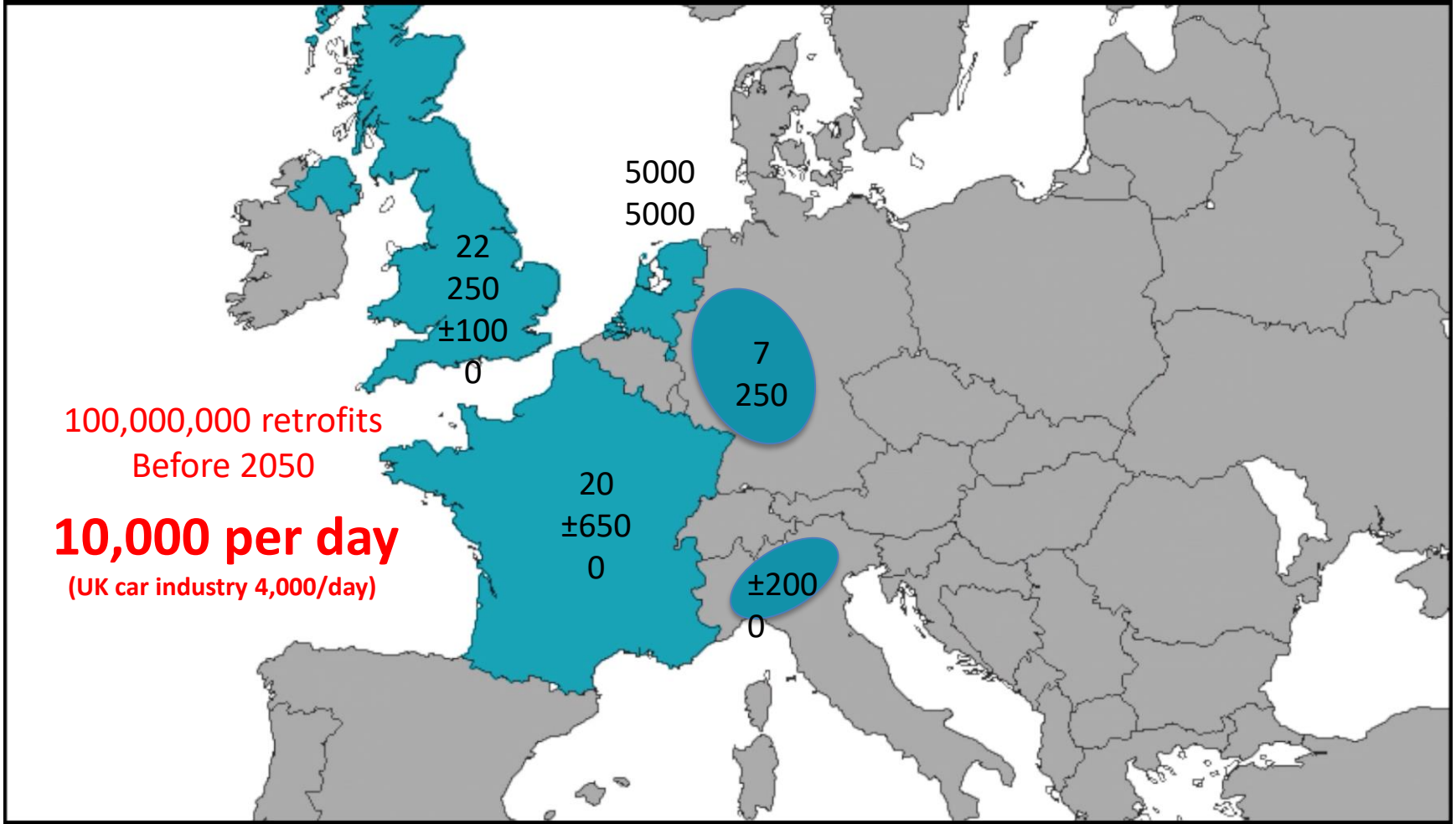


> easy to understand product with guaranteed outcomes

2014


2015


2017

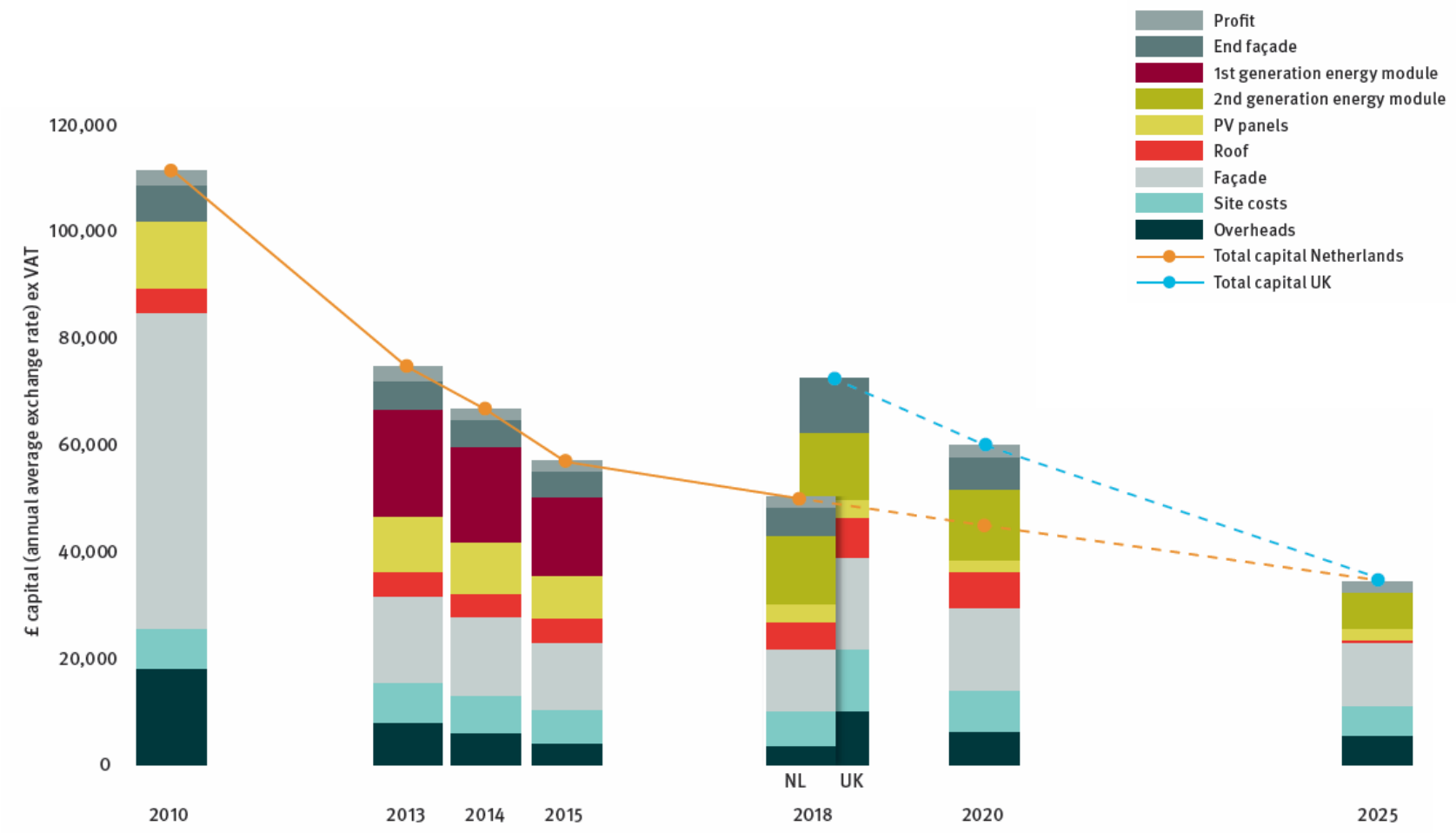

5000
5000
22
250
±100
0
7
250
20
±650
0
±200
0
100,000,000 retrofits
Before 2050
10,000 per day
(UK car industry 4,000/day)

UKHA
INSIDE HOUSING 2018
WINNER

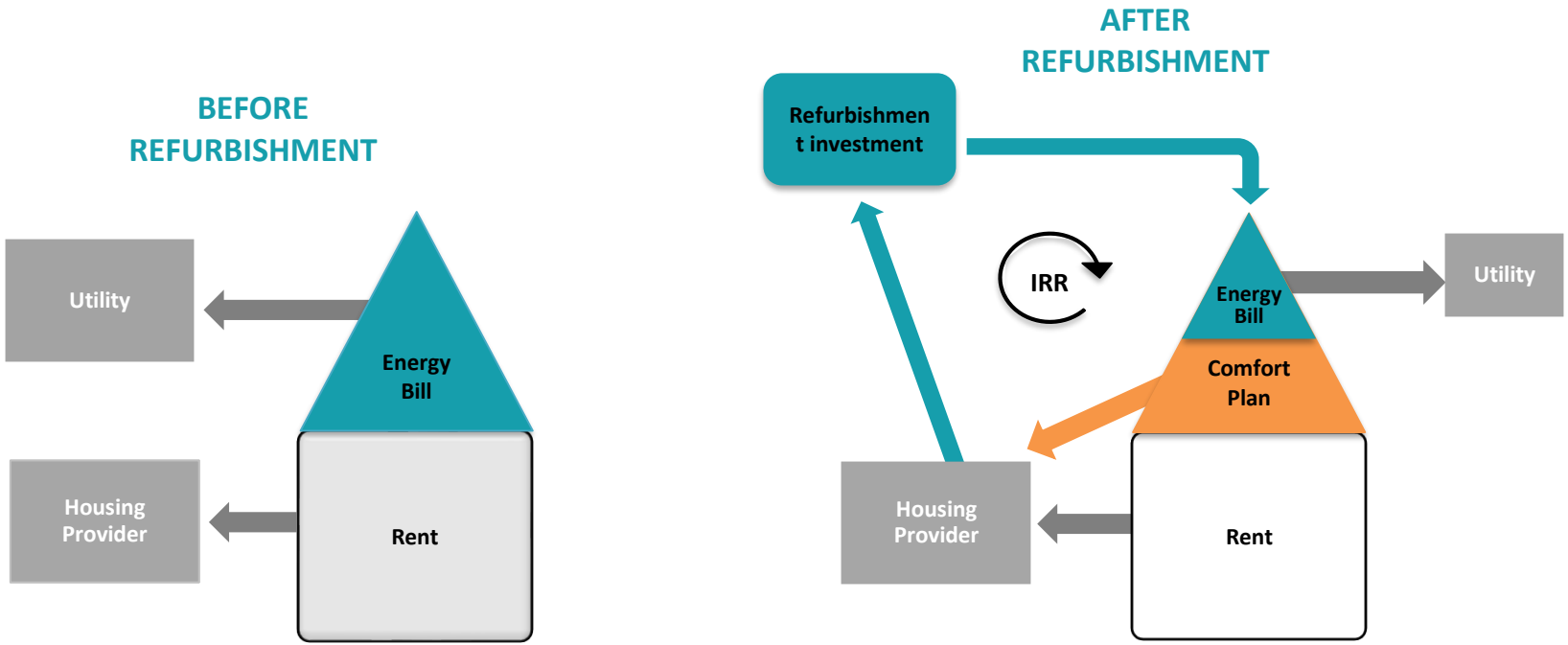
Nottingham, 2018

Ashden Award winner 2019

Essex, 2019


Profit
End façade
1st generation energy module
2nd generation energy module
PV panels
Roof
Façade
Site costs
Overheads
Total capital Netherlands
Total capital UK
£ capital (annual average exchange rate) ex VAT
120,000
100,000
80,000
60,000
40,000
20,000
0
2010
2013
2014
2015
NL
UK
2018
2020
2025

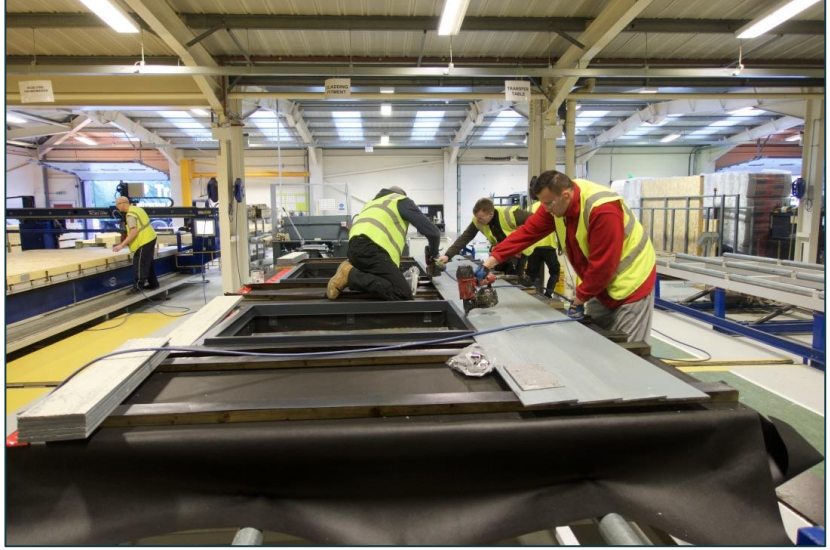
1. New Business Model

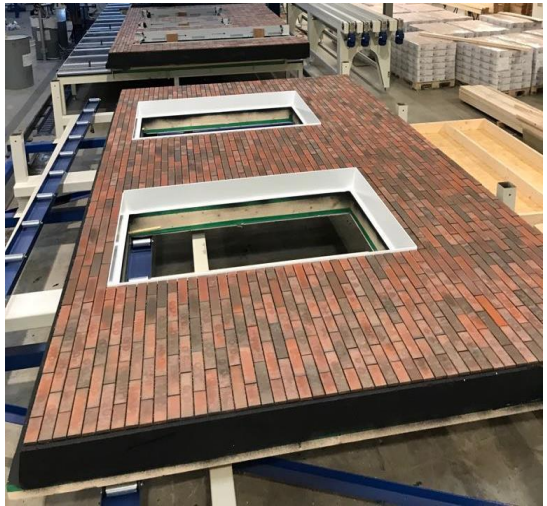


2. Ask for Something Better

“If I had asked people what they wanted, they would have said **faster horses**.”

3. Industrialise





Stay in touch

Jon Warren
Market Development Team
07980 691733
jon.warren@energiesprong.uk

Energie Sprong uk

Questions and Discussion