Hope Valley Climate Action

Decarbonisation and Retrofit: Managing Risks

25 April 2022

Dr Peter Rickaby

Energy and Sustainability Consultant, Savills

Chair, BSI Retrofit Standards Task Group

Honorary Senior Research Fellow, University College London

Decarbonisation and Retrofit

- Why retrofit?
- Where does retrofit go wrong?
- Decarbonisation principles
- Each Home Counts
- Publicly Available Specification (PAS) 2035
- Retrofit Quality Assurance
- Questions and discussion

"Retrofit is not rocket science – but it is complicated"
Rick Holland, Innovate UK

Why Retrofit?

- Homes contribute 30% of UK GHG emissions
  - The UK stock is 27 million homes
  - 80% of existing homes will still be standing in 2050
- Electrifying heat and hot water would require
  - 30x as much offshore wind power (or equivalent)
  - 12x as much wind power with heat pumps (CoP 2.5)
  - 4 x as much wind power with retrofit
- No zero carbon homes without demand reduction
  - Say 25 million retrofits over 30 years @ £25,000
  - 5 retrofits per minute!
  - Total cost £625 billion

Where does retrofit go wrong?

- Lessons from *Retrofit for the Future* (2009-2014)
- At corners, junctions, edges and interfaces
  - Physical connections between building elements
  - Interfaces between building fabric and building services
  - Interfaces between building services and occupants
- Ventilation
  - Critical to the health of the building and of the occupants
    - No insulation without ventilation
  - Poorly designed, installed, commissioned and maintained
    - Switched off by occupants! (perceived as noisy, draughty, expensive)
- Moisture
  - Most risks are moisture-related

Zero Carbon Principles

1. Don’t make assumptions about current unknowns
   - The emissions factor for electricity in 2050
   - The characteristics and costs of local energy storage
   - The extent of hydrogen substitution in the gas grid
   - The extent of penetration of low carbon heat networks
2. Adopt a ‘no regrets’ energy demand-reduction strategy
   - Decarbonisation and retrofit are not alternatives
     - Grid decarbonisation is impossible without demand reduction
   - Allow time for investment in the electricity network
     - Simultaneous transitions to domestic HPs and to EVs are impractical

Zero Carbon Principles

3. Focus first on fuel poverty, then on emissions reduction
   - Because cold households don't care about emissions
4. Adopt the 'fabric first' approach
   1. Improve the building fabric (and ventilation) to reduce demand
   2. Improve and decarbonise building services to satisfy demand efficiently
   3. Use renewable energy technologies to 'top up' to zero carbon
5. Establish a staged whole-house improvement plan
   - For each dwelling
   - Very few householders or landlords can afford to do retrofit all at once

Zero Carbon 1-2-3

1 Improve the building fabric to reduce demand

- Improve the whole building envelope: walls, roofs, floors, openings
  - No insulation without ventilation
- Aim to minimise or eliminate fuel poverty
  - HMG's current EPC band C target (SAP 69) is inadequate, does not provide affordable warmth
  - Consider the best practice Passive House Enerphit standard
- Some traditionally constructed homes cannot be adequately insulated
  - Roof-mounted solar PV with batteries may be an alternative
  - Other dwellings should receive deeper retrofit, to compensate
  - Aim for average 60% reduction in energy demand, across the stock
  - Consistent with 4 x expansion of offshore wind power (Heat & Buildings Strategy)

Zero Carbon 1-2-3

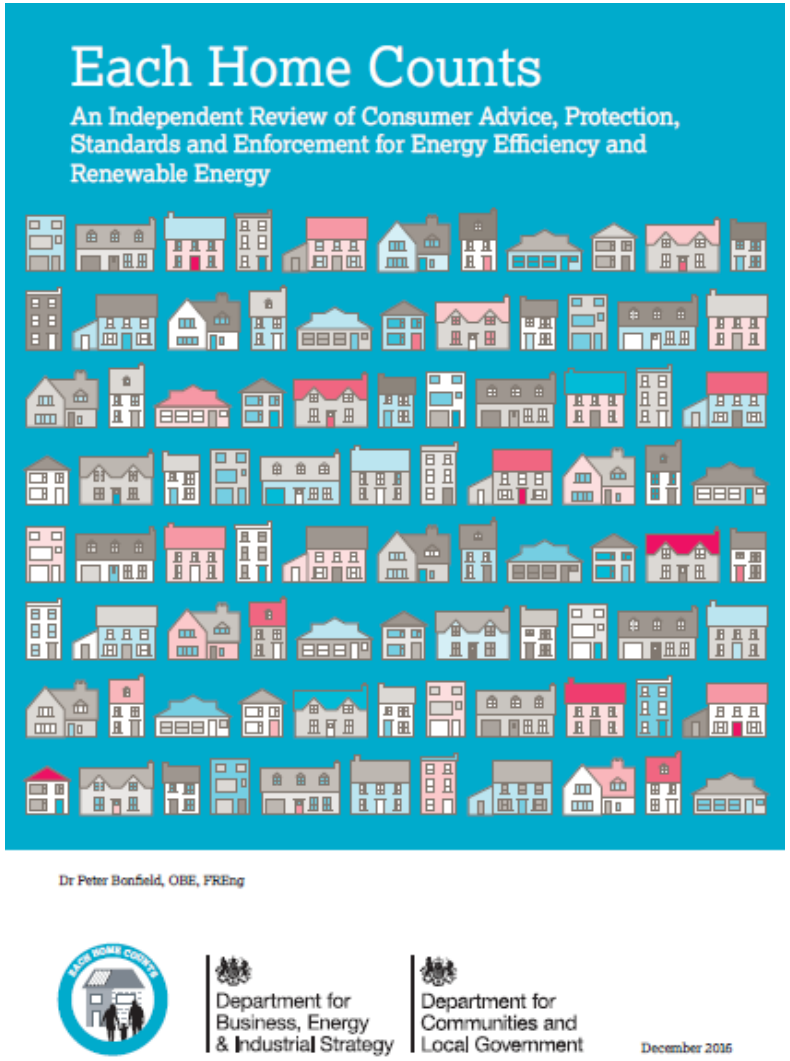
2 Improve the building services and controls

- Focus on heating, hot water and cooking
  - Ventilation already done in Stage 1, lighting driven by EU standards
- Remove fossil fuels – options are
  - Individual ASHPs, communal GSHPs (for blocks and small estates), low carbon heat networks (in some urban areas)
- Get dwellings ‘zero carbon ready’

3 Add local renewable energy to achieve zero carbon

- Options will include:
  - Solar PV systems (with battery storage)
  - Solar thermal systems (for hot water)
  - Community wind power (local or remote)
  - May be constrained by the available roof area

Each Home Counts



Industry-led review

- Sponsored by BEIS and MHCLG
- Led by Peter Bonfield (BRE)
- Multiple work-streams
- Hundreds of people involved

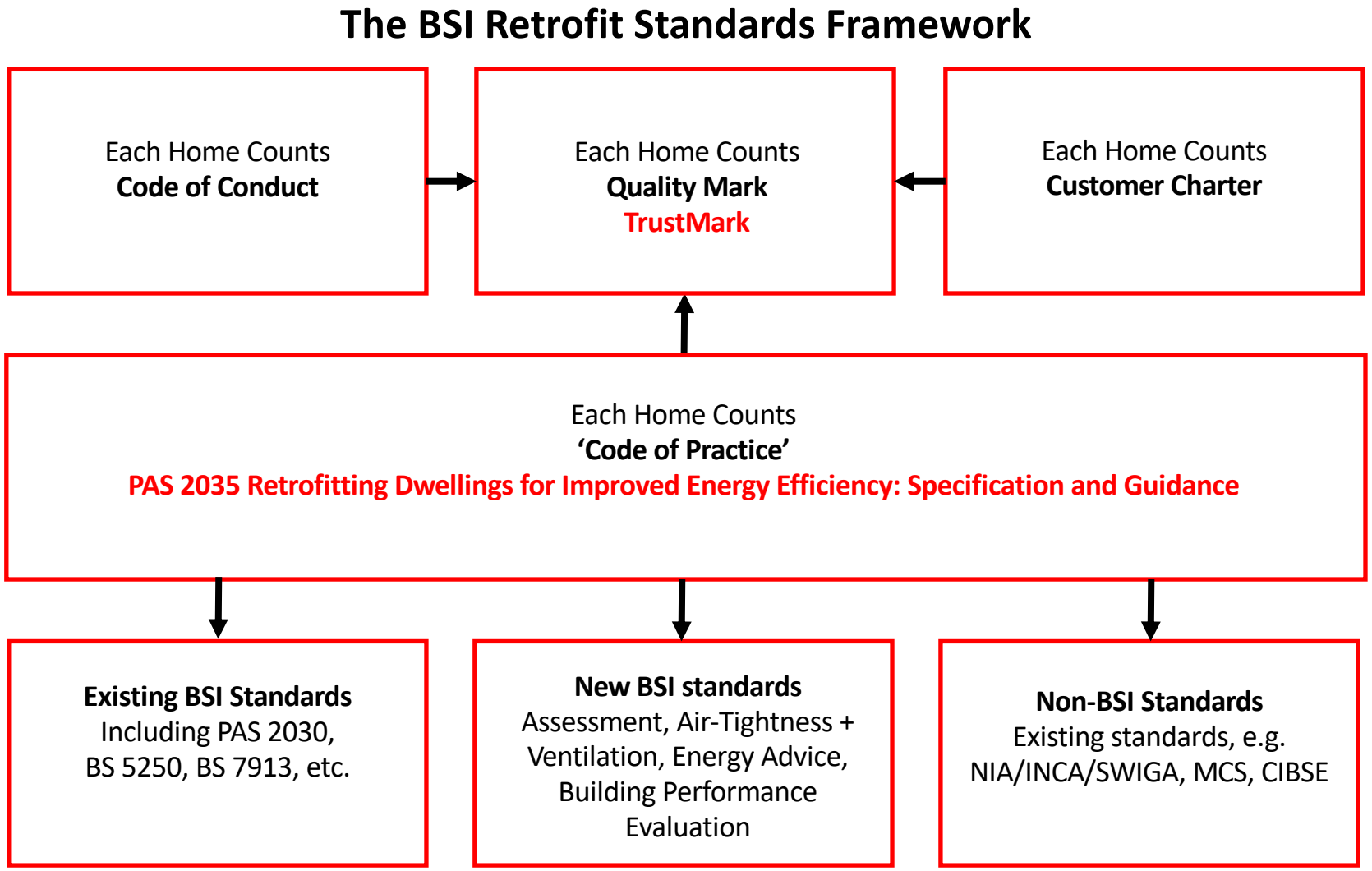
Twenty-seven recommendations

- Consumer protection
- Advice and guidance
- Quality and standards
- Skills and Training
- Compliance and Enforcement
- Insulation and building fabric
- Smart meters
- Home energy technologies
- Social housing

Implementation

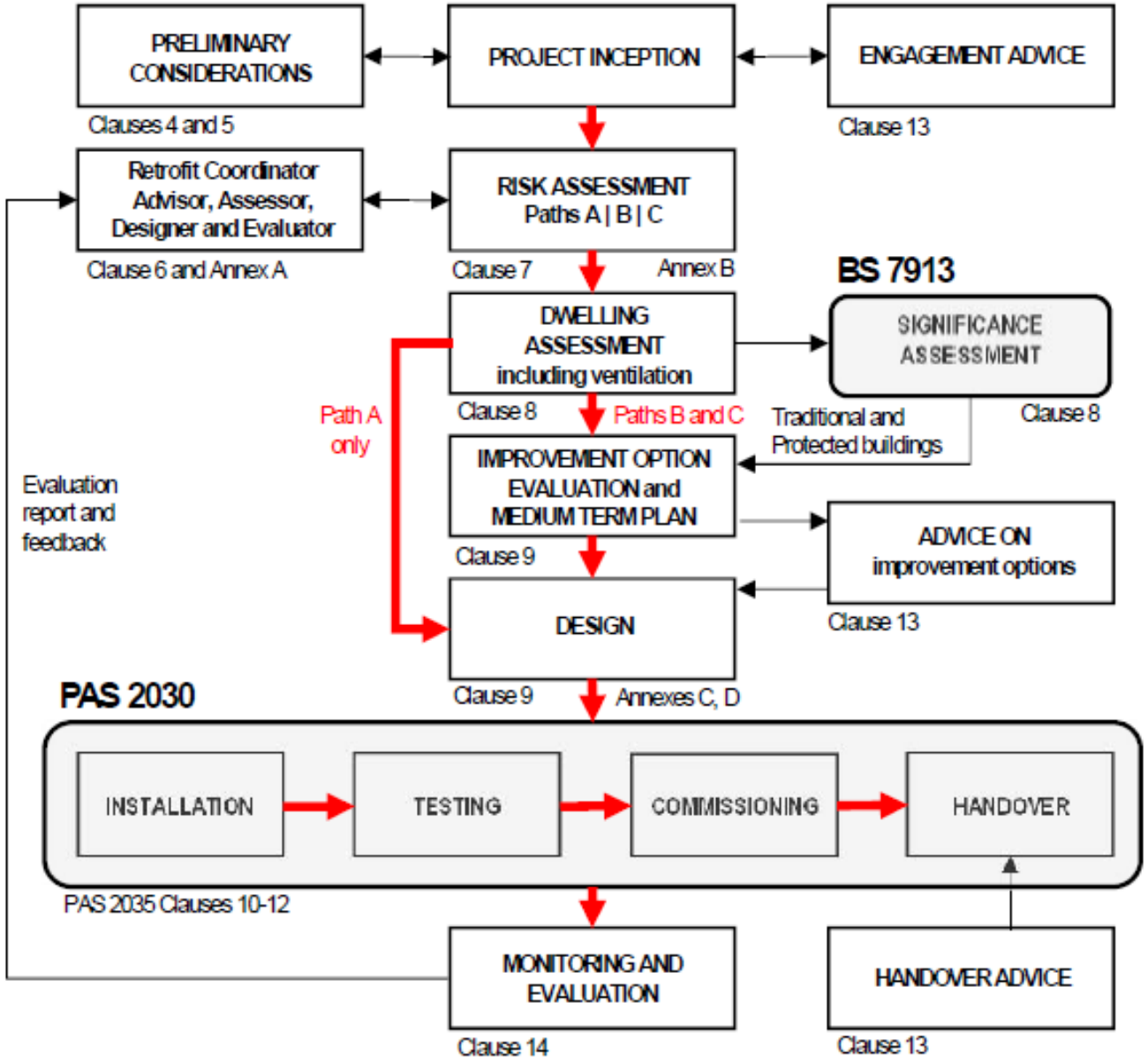
- Coordinated by a cross-industry Implementation Board
- BEIS support > £3 million

Retrofit Standards



PAS 2035

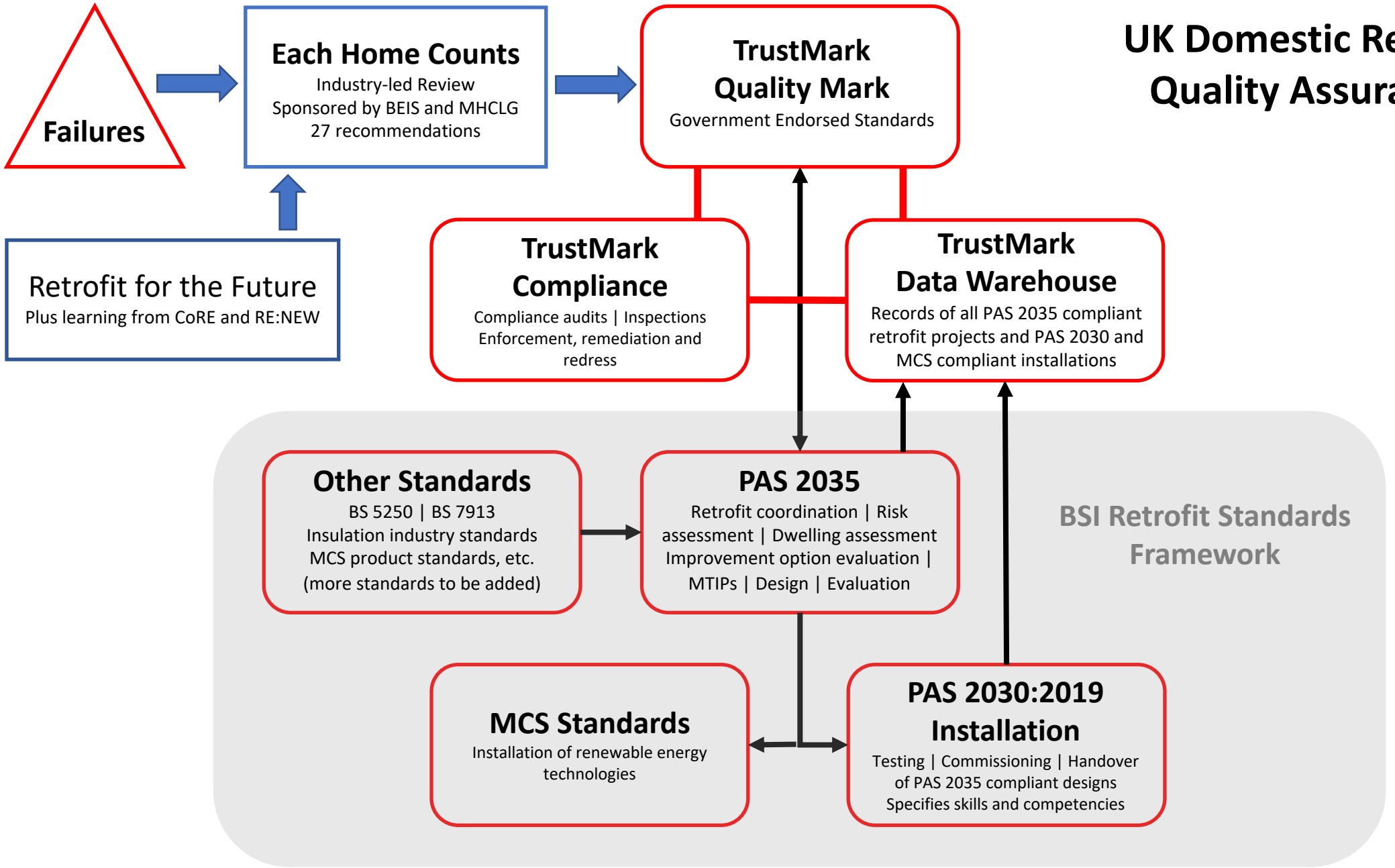

PAS 2035:2019
Incorporating Corrigendum No. 1
Retrofitting dwellings for improved energy efficiency – Specification and guidance
Department for Business, Energy & Industrial Strategy
bsi.


PRELIMINARY CONSIDERATIONS
Clauses 4 and 5
PROJECT INCEPTION
ENGAGEMENT ADVICE
Clause 13
Retrofit Coordinator Advisor, Assessor, Designer and Evaluator
Clause 6 and Annex A
RISK ASSESSMENT Paths A | B | C
Clause 7
Annex B
BS 7913
DWELLING ASSESSMENT including ventilation
Clause 8
SIGNIFICANCE ASSESSMENT
Clause 8
Path A only
Paths B and C
Traditional and Protected buildings
Evaluation report and feedback
IMPROVEMENT OPTION EVALUATION and MEDIUM TERM PLAN
Clause 9
ADVICE ON improvement options
Clause 13
DESIGN
Clause 9
Annexes C, D
PAS 2030
INSTALLATION
TESTING
COMMISSIONING
HANDOVER
PAS 2035 Clauses 10-12
MONITORING AND EVALUATION
Clause 14
HANDOVER ADVICE
Clause 13

PAS 2035 Summary

- Risk assessment
  - Based on pre-assessment (triage)
  - Determines the Path (A-C) through the PAS
- Required qualifications depend on assessed risk
  - All projects must have a Retrofit Coordinator
  - Professional qualification required for other roles
- Design
  - Requirements depend on the risk Path (A-C)
  - Improvement option evaluation and medium term plans required (B, C)
  - Additional requirements for traditionally constructed and protected buildings (C)
- Ventilation
  - Assess existing, upgrade if inadequate or will become inadequate on retrofit
- Installation
  - Must comply with PAS 2030:2019 (requires installers to have certified competence)
- Evaluation
  - Confirms agreed outcomes, investigates discrepancies

UK Domestic Retrofit Quality Assurance



Questions and discussion

Hope Valley Climate Action

Decarbonisation and Retrofit: Managing Risks

25 April 2022

Dr Peter Rickaby
Energy and Sustainability Consultant, Savills
Chair, BSI Retrofit Standards Task Group
Honorary Senior Research Fellow, University College London
peterrickabyconsultancy@gmail.com