



---

**Programme Area:** Buildings

**Project:** Building Supply Chain for Mass Refurbishment of Houses

**Title:** Executive summary of the change management roadmap report

---

**Abstract:**

Please note this report was produced in 2011/2012 and its contents may be out of date.

**Context:**

This project looked at designing a supply chain solution to improve the energy efficiency of the vast majority of the 26 million UK homes which will still be in use by 2050. It looked to identify ways in which the refurbishment and retrofitting of existing residential properties can be accelerated by industrialising the processes of design, supply and implementation, while stimulating demand from householders by exploiting additional opportunities that come with extensive building refurbishment. The project developed a top-to-bottom process, using a method of analysing the most cost-effective package of measures suitable for a particular property, through to how these will be installed with the minimum disruption to the householder. This includes identifying the skills required of the people on the ground as well as the optimum material distribution networks to supply them with exactly what is required and when.

---

**Disclaimer:**

The Energy Technologies Institute is making this document available to use under the Energy Technologies Institute Open Licence for Materials. Please refer to the Energy Technologies Institute website for the terms and conditions of this licence. The Information is licensed 'as is' and the Energy Technologies Institute excludes all representations, warranties, obligations and liabilities in relation to the Information to the maximum extent permitted by law. The Energy Technologies Institute is not liable for any errors or omissions in the Information and shall not be liable for any loss, injury or damage of any kind caused by its use. This exclusion of liability includes, but is not limited to, any direct, indirect, special, incidental, consequential, punitive, or exemplary damages in each case such as loss of revenue, data, anticipated profits, and lost business. The Energy Technologies Institute does not guarantee the continued supply of the Information. Notwithstanding any statement to the contrary contained on the face of this document, the Energy Technologies Institute confirms that it has the right to publish this document.

## ETI Executive Summary

<b>Programme:</b>	Buildings
<b>Project Name:</b>	Optimising Thermal Efficiency of Existing Housing
<b>Deliverable:</b>	BU1001 / D4.5 – Change Management Roadmap

## Introduction

UK Residential buildings account for ~27% of the UK energy production, ~26% of CO<sub>2</sub> emissions and 23% of GHG emissions. 82% of the energy consumed in the UK residential buildings is for space heating and hot water. If the demand on the UK energy system from housing can be reduced then this will have a significant impact on CO<sub>2</sub> emissions and reduce the level of low CO<sub>2</sub> energy generation required.

The number of domestic dwellings in the UK is expected to rise to 32 million by 2050 from 26 million currently, of which 21 million are expected to remain in 2050. The refurbishment of existing dwellings is therefore a significant factor in achieving the 2050 target CO<sub>2</sub> reduction target.

The Optimising Thermal Efficiency of Existing Housing project is focussed on the refurbishment of the existing UK housing stock to improve its thermal efficiency and to investigate ways the refurbishment process can be accelerated at a national level.

The key outputs from the project are:

- A model capable of running “what if” scenarios for a range of UK house types showing the retrofit technologies required to optimise CO<sub>2</sub> reduction, minimise cost and maximise comfort/value to the customer
- A model capable of running scenarios at the local, regional and national level to identify the CO<sub>2</sub> impact and cost of various mass retrofit plans
- Defined delivery mechanisms (policies, supply chain requirements etc) for retrofitting the domestic housing stock at a sufficiently high rate to impact national climate change targets

The project is divided into 7 work packages to better enable it to address the outputs required above:

**Work Package 1:** Understanding thermal performance of the housing stock at an individual dwelling level.

**Work Package 2:** Impact of thermal efficiency measures on the UK housing stock.

**Work Package 3:** Developing retrofit solutions to improve thermal performance of our national housing stock.

**Work package 4:** Developing a sustainable supply chain to deliver whole house retrofit on a national scale.

**Work Package 5:** Understanding customer value & maximise the take up of retrofit.

**Work Package 6:** Developing the policy and regulatory framework to manage, support and encourage whole house retrofit.

**Work Package 7:** A consolidation of the issues associated with Health and Safety in mass scale retrofit

Work Package 4 is specifically focussed on the delivery mechanisms aspect of the project, in particular the supply chain element and how to effectively deliver the optimum retrofit interventions identified through collaborative work across the other work packages.

There are 7 deliverables within Work Package 4, these are:

**D4.0 Current Supply Chain Map:** A visual representation of the material and installation capability for the current retrofit supply chain.

**D4.1 Draft Supply Chain Design:** A draft Value Stream Map of potential Retrofit Supply Chains covering material, distribution, customer engagement, survey, installation and customer service.

**D4.2 Draft Supply Chain Scenarios:** Evaluation of refurbishment and supply options as the inputs to a change management plan which will achieve the mass delivery of the whole home refurbishment programme.

**D4.3 Refurbishment Supply Chain Implications:** Market review to establish existing players' current and potential capability and willingness to deliver the mass retrofit. Summary of requirements for incentives or legislative change to enable transition at a sufficient pace as an input into WPs 5 & 6.

**D4.4 Detailed Supply Chain Workshop:** The design of an end to end supply chain model and specification

**D4.5 Change Management Roadmap:** Bringing together the technical (WP3) and customer (WP5) requirements to quantify the gap between current and required capability. This deliverable will develop a costed, resourced and scheduled plan.

**D4.7 Final Summary Report:** A final summary of the activities and findings for work package 4.

## Basis of Designs

Prior work in Work Package 4 has led to the design of a future state supply chain capable of delivering mass scale retrofit in the UK, this is documented in deliverable 4.4.

The objective of deliverable 4.5 is to develop a Change Management Roadmap that details the actions needed to transform the supply chain to deliver retrofit effectively at scale. The report presents a top level transformation plan together with the timescales, actions and estimated costs necessary to realise the future state supply chain that has been proposed as part of the project.

The roadmap for change presented in this deliverable was developed using a *right to left* approach. This was a 3 stage process:

- 1) Splitting the retrofit process into delivery steps and supporting activities, adding a description / specification at each step for the *future state*, this future state is documented in deliverables 4.3 and 4.4.
- 2) Add the current state for the existing supply chain
- 3) Identify the transformation route from current state to desired future state, the participants required to take action, prioritisation and the likely costs / timeframes. The goal being the capacity to achieve 400,000 retrofits per year by 2020. The result of this activity is the transformation plan identified in this deliverable.

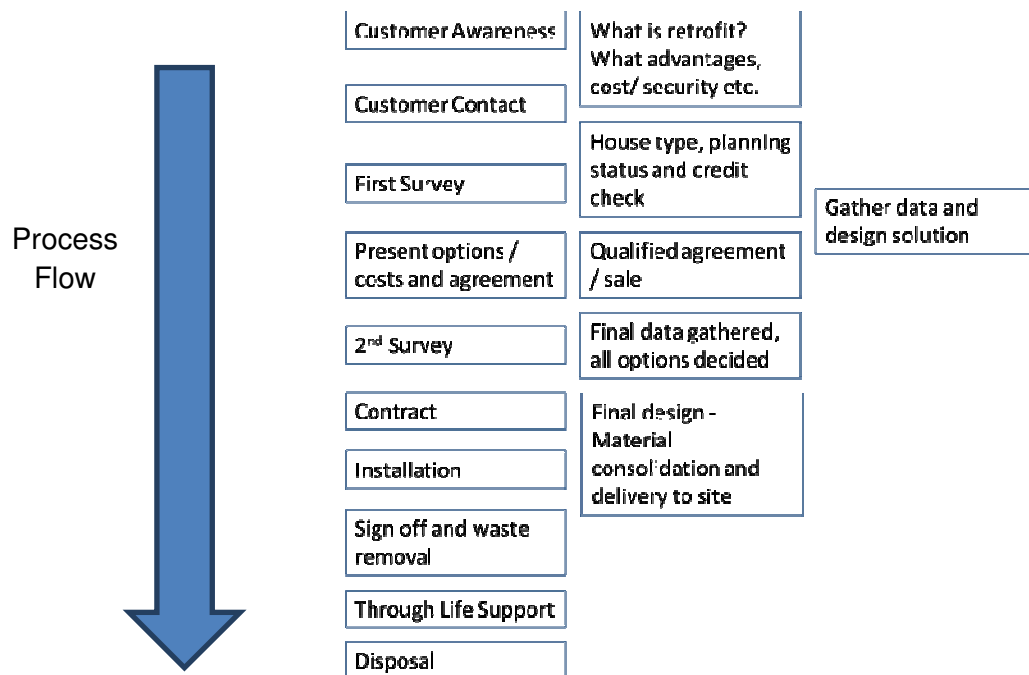


Figure 1: Simplified Retrofit Process Chart

Following the development of the transformation roadmap a stakeholder matrix was created and populated. Many of these stakeholders in the existing supply chain had been involved in the development of the proposed future state supply chain through a series of workshops. Stakeholders were engaged and asked to review and critique the plans proposed for mass retrofit and provide insight into their viability, the necessary commercial drivers and where barriers to success may exist.

Finally a SWOT and PESTLE analysis was carried out to identify any region specific needs in terms materials manufacture and distribution.

## Results summary

As a result of the analysis carried out within this work package and deliverable, the following requirements have been identified as being necessary to achieve the levels of efficiency and economy needed to support mass retrofit of domestic properties in the UK.

The retrofit industry will need to:

- Stimulate consumer demand with a comprehensive public awareness programme about the benefits of retrofit and what is available
- Design a new, highly effective supply chain that protects commercial gain but is unencumbered by existing practices
- Move as close to the “least wasteful” supply chain model as possible and encourage collaborative working and a consortia approach to supply
- Decrease variety of product type and standardise as much as possible to drive up volume and decrease the overall stock holding burden
- Optimise delivery to site with customised solutions delivering all materials in one go with non HGV transport
- Simplify the accreditation of materials / systems for retrofit to allow greater competition and decrease time (and cost) to market for new developments
- Provide effective training packages for Sales, Surveyors, installers
- Provide a stable base on which to build a retrofit industry with transparent funding mechanisms and incentives.
- Consider any special geographic considerations such as areas of the UK which are off the gas grid or where weather conditions restrict outdoor working time available.

## Key findings

The key areas of work carried out within this deliverable are listed below, together with the principal findings associated with them. Further detail is presented in the deliverable document itself and the extensive appendices include within it.

### **Transformational roadmap, plan and high level budget**

A transformational roadmap has been developed by the project consortium, this detailed in section 4.2 of the deliverable and supported by the below high-level Gantt chart

		2013				2014				2015			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
		Stakeholders											
1	Set up helpline and website	Marketing, IT											
2	Confirm legislation relating to end of life disposal	Pilot team											
3	Set up and develop franchise company infrastructure for delivery. Tools/equipment, training agreements, for geographical areas	Pilot team											
4	Develop finance products for retrofit, linked to ECO incentives	DECC, Green Deal Finance Company											
5	Establish top level franchise business	Pilot team, ETI											
6	Develop install team competences, recruitment plan, training plan, quality plan, induction plan, safe systems of work, customer management	Pilot team											
7	Customer awareness campaign	Government											
8	Create standard procedure plans for: health and safety, programmes, insurance, logistics, access, customer change, complaints.	Legal, pilot team											
9	Material and equipment: storage contract, waste contract, customer confirmation plan	Material suppliers, distribution, logistics, suppliers, installers											
10	Develop scheduling/planning tool for retrofit	Suppliers, manufacturer, installer, pilot team											
11	Develop energy monitoring Plan	Academic partner, research partner											
12	Engage insurance community and develop warranty products for retrofit, survey and install	Legal, pilot team											
13	Develop customer handover procedure	Franchiser											
14	Hand over plan and maintenance programme	Franchisor											
15	Create procedure for warranty claims	Procurement, insurance agent, legal											
16	Procure standard survey tool kit	Pilot Team											
17	Develop standard work for Survey #2 based on robust FMEA	Pilot Team											
18	Generate standard contracts for retrofit	Legal, Pilot, Franchise											
19	Establish social media presence	Franchise											
20	Establish open database	Franchise											
21	Develop marketing plan (target segments)	Marketing, modelling											
22	Expert support agreements	Legal, franchiser											
23	Develop retrofit demonstration centres and show homes	Pilot team											
24	Standard agreement for survey 2 and way leaves	Legal											
25	Data storage device with cost evaluation	Pilot team, franchise											
26	Standard forms of contract	Franchise, legal											
27	Develop software application for energy modelling/assessment	Pilot team											
28	Simplify planning process or streamline	Pilot team, ETI, DCLG											
29	Develop standard assessment process linked to cost model/BOQ system	Franchise											
30	Develop accreditation and training systems for: survey 1, survey 2 and install	Pilot team, franchise											
31	Franchise/brand awareness	Franchise											
32	Establish "whole house retrofit"	Franchise											
33	Develop Individual install schedule, material supply contract, Trained Labour, Plant, approval systems	Pilot team											

The plan illustrates the headline tasks that need to be completed to transform the current trade based and siloed supply chain to one which is effective and easily scalable. The focus is on the scalable unit, namely the 4 man poly-competent installation team proposed in deliverable 4.4. This unit could be deployed with a variety of headline delivery organisations to serve any customer segment / property type in an efficient manner. It is also the easiest model of those considered to scale quickly.

An estimated budget of £54m is proposed to support the roll-out of the transformation roadmap.

The proposed first stage in building momentum is proving and demonstrating the retrofit process using the poly-competent team concept. By successfully demonstrating the physical process then gaining buy-in and traction with the existing supply chain will be simplified. Section 4.1 of the report estimates a cost of ~£4m to demonstrate retrofit in 100 homes over an 18 month period, detailed costs are included in appendix 1 of the report.

### **Stakeholder review**

A key part of the project has been engaging with the existing supply chain and key stakeholders to acquire input and comment on the proposed solutions generated by the project. Around 40 stakeholders were identified and asked to critique the proposals from the supply chain element of the project. Insight was gained on the proposals through a number of lenses, as listed below:

- Customer demand
- Existing supply chain capacity
- Supply chain configuration
- Survey
- Poly-competent team
- Delivery of materials to site in one drop
- Installation schedule

No stakeholder had considered the complete suite of changes that were presented in the stakeholder feedback document (appendix 2). Some supply side companies had considered a consortium approach but not re-designing supply from an end to end perspective. Some delivery companies had considered an element of basic multi skilling but not challenging and reconfiguring the supply side.

It is proposed that to be successful in realising a truly world class supply chain then a systems approach is required, this will require a leading organisation or body and it is unclear at this time who this will be.

### **Commercial drivers**

To achieve the levels of domestic housing retrofit required to achieve the UK's climate change objectives companies delivering retrofit must believe that there is sufficient commercial gain in the market to justify an appropriate investment. A concern is that the public will not see the value in retrofit as a result of the expectations set by subsidised insulation.

As a result of the stakeholder review the following commercial drivers were identified:

- Establishing a market for whole house retrofit
- Establishing a stable foundation for retrofit with long term certainty of regulation, subsidies, incentives and other government initiatives likely to distort the market.
- Making sure the retrofit works are paid for by the client (there is a growing trend of customers that complain in order to delay payment or achieve discounts on the agreed price of work)
- Establishing cost effective insurance backed warranties to cover the long term liabilities of measures installed during retrofit.
- Establishing a robust process to deliver retrofit at a price that the customer is willing to pay.

### **Obstacles & Risks**

To understand the landscape around retrofit and define the risks and obstacles to the proposals in this and preceding reports on supply chain development two actions were taken:

- 1) A SWOT analysis was carried out for each of the proposed retrofit interventions
- 2) A PESTLE analysis on the overall global environment on matters that could affect the retrofit supply chain and the take up of retrofit.

The detailed analysis is presented in appendix 4 of the deliverable.

The principal obstacles were identified as:

- Resistance to change within areas of the existing supply chain. Change is perceived as a reason to reduce costs which is usually achieved by reduced margin; the benefits of transforming the industry through the elimination of waste and improving working practices cannot yet be visualised.
- High cost of finance is seen as an obstacle to the take up of retrofit and investment to enter the market as a retrofit provider. Green deal finance is predicted to be offered at 6.5%PA where secured finance is currently available for around 3 – 3.5% PA
- Resistance to train people to work across trade boundaries, for the Poly-Competent team to viable a new set of competences needs to be developed along with training courses, qualifications etc. Availability of suitable courses and the benefits (both financially and socially) could overcome this over time.
- The lack of an established market is probably the biggest obstacle to establishing a new highly effective supply chain; established businesses are loath to invest in an uncertain market.

Most of the scepticism about transforming the current supply chain was felt to exist because the construction sector is extremely traditional and conservative. Education and illustration by example are the suggested solutions to the problem.

The principal risks were identified as:



- Changes required to training and accreditation, insurance and warranties to support the polycompetent team concept specifically and the supply chain transformation in general will not keep pace and that no single business entity will step forward and lead the transformation of the supply chain
- A lack of focus on Health and Safety and quality as the industry is growing will cause customers to shy away from retrofit

These risks may be mitigated through a robust pilot project. This would demonstrate the concept and establish the specification for whole house retrofit and the quality guidelines and measures that are needed to maximise success.

### Geographical Considerations

A number of geographical considerations need to be kept in mind when considering the mass roll out of retrofit

The national distribution systems in **Northern Ireland** are not well developed, being characterised with a strong reliance on relatively small independent merchants. In addition the gas distribution grid is undergoing expansion and coverage is less than in mainland UK

Areas of **Wales and Northern Scotland** have a higher prevalence of off gas-grid properties which would require alternative heat sources. At the same time the reliance on LPG, oil, electric could act as a catalyst for the deployment of retrofit as a means of reducing energy bills.

Parts of the UK with lower average temperatures and high rainfall will likely experience lower levels of productivity in the roll out of retrofit, this could in part be offset by product development in the form of 'dry' External Wall Insulation products where there is no need to wait for a dry day to apply a wet finish.

A lack of consistency in the interpretation of planning standards across the UK (there are 63 planning authorities in the North West of the UK alone) could lead to problems in the roll out of mass scale retrofit.

### Material and Process Change Requirements

A number of opportunities for product and process improvements were identified by the project team as a result of the SWOT and PESTLE analysis:

Product / Measure	Change Type	Change Requirement
EWI	New Product	Create a range of finishes that can cover all existing construction types without losing existing character – e.g. Stone.
EWI	Tools	Develop a flexible working at height solution that is quick to install and easy to store
EWI	New Product	Design a new product that has a dry or pre finished process removing the wet trade requirement.

EWI	New Product	Design a new finish that is as robust as the primary construction fabric (stone, brick etc).
EWI	New Product	Design a new product that does not require more maintenance than the original fabric.
EWI	New Product	Design a new product that enables large components to be pre-fabricated off site to lower install time.
IWI	New Product	Thinner insulation / covering product that remove the need to baton and over board. The application would also benefit from a dry finish removing the need for skimming and reducing disruption and interaction with other items e.g. heating and electrics.
IWI	New Product & Process	Reduce the chances of damage to existing building contents through, dust debris and accidental contact. Enhance sealing of existing fabrics and work area segregation to reduce contamination. Eliminate wet trades.
Loft / Roof Insulation	New Product	Reduce the limitation of having to leave existing wiring exposed by introducing an easy fix over duct.
Loft / Roof Insulation	New Product	Create warm roof space by under roof insulation to increase warm / dry storage or extra room.
Primary Heat	Process	Ensure heating system is not over or incorrectly specified for maximum efficiency.
Primary Heat	Product	Design heating systems with inbuilt cut Carbon Monoxide detection and cut off.
Windows & Doors	Product	Continue to innovate windows and doors to resemble natural materials.
Windows & Doors	Product & Process.	Develop product and process to enable windows to be fitted without disruption or working at height.
Windows & Doors	Process.	Improve and standardise the town planning, building control and regulation processes associated with windows and doors.
Floors	Product	Innovate insulating products that can be overlaid on to existing floor coverings to reduce disruption and labour.
Floors	Product & Process	Evolve a foam based product installed using “key hole” methods to reduce disruption and labour.

## Further work

Further work on buildings retrofit will be addressed as part of the ETI Smart System and Heat programme. Opportunities are being sought to demonstrate the concepts from the OTEoEH project.

## References

- D3.4a – Virtual Refurbishment Report
- D4.0 – Current Supply Chain Map
- D4.4 – Detailed Supply Chain Workshop