REMSOB F1 Submission

Response to the Government's Green Paper on Energy Policy in Ireland dated May 2014

Dated: July 2014

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ABSTRACT

This paper responds to the Government's Green Paper on Energy Policy by public consultation invite. In particular this paper addresses "Priority 1 - key questions 3 and 5" with regard to encouragement of large scale uptake of home retrofit and infrastructural and financial approaches to facilitate the means.

Looking primarily to European examples the report examines financing approaches for energy retrofits. In probing those models that have been highly successful, and another that has failed to create any significant demand since its launch, the report strongly supports the model that has had outstanding proven success as the one that Ireland should adapt as a basis for its own model. Using this proven model, the results show that a typical 'Whole House' residential retrofit of a small semi-detached house (<100m²) could be funded with a long term loan and repaid with the energy cost savings over a 27 year period.

The preposition for the argument is based upon the notion that in order to incentivise large scale national uptake of home and building retrofit, a viable and accessible finance strategy must exist to support this action. In addition the report proposes that the key to meeting committed targets on CO_2 mitigation for 2020 can thus be met whilst creating significant new construction sector employment and simultaneously stimulating a domestic economic recovery through large scale retrofit activity.

GLOSSARY

Air tightness: is the resistance of the building envelope to inward or outward air leakage. Excessive air leakage results in increased energy consumption and draughty, cold buildings.

BER: Building Energy Rating as defined by the SEAI:
A Guide to Building Energy Rating for Homeowners, SEAI 2012

Bioregional: is an entrepreneurial charity which establishes sustainable businesses and works with partners around the world to demonstrate that a sustainable future can be easy, attractive and affordable. **www.bioregional.com**

DECC: Department of Energy and Climate Change, United Kingdom.

DECLG: Department of Environment, Community and Local Government, Ireland

Deutsche Energie-Agentur (DENA): the German Energy Agency is their centre of expertise for energy efficiency, renewable energy sources and intelligent energy systems. DENA's mission is to generate economic growth and maintain prosperity with ever lower energy inputs. They say, if this is to be achieved, energy must be generated and used in both a national and international context as efficiently, safely and economically as possible with the least possible impact on climate.

EnERGo The IEA has developed the Holistic Assessment Toolkit on Energy Efficient Retrofit Measures for Government Buildings (EnERGo) – Annex 46. Access to the Toolkit has to be applied for via: http://www.annex46.de/tool_formular-download_e.html - an email with access codes will be issued by the Fraunhofer Institute of Building Physics (ittoolkit@ibp.fraunhofer.de) – access can then be gained via http://www.annex46.de/toolkit_e/it-toolkit.zip. This gives examples of innovative business models for retrofitting buildings and community systems.

Energy Efficiency Directive (EED): The new Directive entered into force on 4 December 2012. Most of its provisions will have to be implemented by European Member States by 5 June 2014. This Directive establishes a common framework of measures for the promotion of energy efficiency within the Union in order to ensure the achievement of the Union's 2020 20% headline target on energy efficiency and to pave the way for further energy efficiency improvements beyond that date.

EPC (Energy Performance Contracting): it is the government's intention to establish a national Energy Performance Contracting process to deliver innovative models of retrofitting and financing of energy efficiency measures in the commercial and public sectors.

European Commission's Energy Roadmap 2050: The 'own-initiative' report on the European Commission's Energy Roadmap 2050 was adopted on 14 March 2013 in plenary of the European Parliament following a vote in the ITRE Committee on 24 January 2013.

European Investment Bank (EIB) is the European Union's nonprofit long term lending institution established in 1958 under the Treaty of Rome. As a "policy driven bank" whose shareholders are the member states of the EU, the EIB uses its financing operations to bring about "European integration and social cohesion".

Green Deal: United Kingdom Department of Energy & Climate Change: The Green Deal is a Summary of the Government's Proposals, 2010, Crown Press Ref 10D/996

Grenelle de l'environnement: is an open multi-party debate in France that brings together representatives of national and local government and organizations (industry, labour, professional associations, non-governmental organizations) on an equal footing, with the goal of unifying a position on a specific theme. The aim of the "Grenelle Environment Round Table", instigated by the former President of France, Nicolas Sarkozy, in 2007, is to define the key points of public policy on ecological and sustainable development issues.

Green Paper: The government's Green Paper on Energy Policy in Ireland dated May 2014

Home Renovation Incentive: a government initiative to encourage home owners to improve their properties and stimulate the construction sector.
http://www.revenue.ie/en/tax/it/reliefs/hri/hri-general-faqs.html#section1

IEA: The International Energy Agency 9, rue de la Fédération, 75739 Paris Cedex 15, France is an autonomous body which was established in November 1974 within the framework of the OECD to implement an international energy programme. It carries out a comprehensive programme of energy cooperation among 26 of the OECD's 30 member countries.

ITRE: The Committee on Industry, Research and Energy is responsible for the European Union's industrial policy and the application of new technologies. Including measures relating to: SMEs; the Union's research policy, including the dissemination and exploitation of research findings; for Community measures related to energy policy in general; the security of energy supply and energy efficiency including the establishment and development of trans-European networks in the energy infrastructure sector, and for the information society and information technology, including the establishment and development of trans-European networks in the telecommunication infrastructure sector.

Ireland Strategic Investment Fund (ISIF): The National Treasury Management Agency held a market engagement and communication event for the Ireland Strategic Investment Fund (ISIF) at Dublin Castle on 5 March 2014. Under legislation to be passed in the coming months the ISIF will absorb the resources of the National Pensions Reserve Fund with a mandate to invest on a commercial basis to support economic activity and employment in Ireland.

KfW: the Kreditanstalt für Wiederaufbau - Germany's major public investment bank providing financing for energy conservation and renewable energy projects.

Lambda (Conductivity, Thermal value): The rate at which heat is transmitted through a material, measured in watts per square metre of surface area for a temperature gradient of one Kelvin per metre thickness, simplified to W/mK. The Lower the value, the better the thermal efficiency of the material.

Market incentives: are ways of stimulating demand for particular products or activities through financial inducement in the shape of subsidies, favourable loans, grants and tax concessions.

NEEAP 2020: Ireland's Second National Energy Efficiency Action Plan to 2020, Dec 2012, Department of Energy, Communications & Natural Resources

OECD: Organisation for Economic Co-operation and Development

Passive house: describes new homes requiring very little energy. A passive house standard is 15 kWh/m² yr.

PPP: a public–private partnership (PPP) is a government service or private business venture which is funded and operated through a partnership of government and one or more private sector companies. There are usually two fundamental drivers for a PPP. Firstly, the PPP claims to enable the public sector to harness the expertise and efficiencies that the private sector can bring to the delivery of certain facilities and services traditionally procured and delivered by the public sector. Secondly, a PPP is structured so that the public sector body seeking to make a capital investment does not incur any borrowing. Rather, the PPP borrowing is incurred by the private sector vehicle implementing the project and therefore, from the public sector's perspective, a PPP is an "off-balance sheet" method of financing the delivery of new or refurbished public sector assets.

REMSOB F1 is a group of construction professionals, primarily architects, together with some chartered building surveyors, chartered quantity surveyors and architectural technologists, who have studied and been trained in Energy Efficient Building Systems in Germany at the Centre of Excellence "Kompetenz Zentrum Holzbau and Ausbau".

Retrofit: means to remodel, adapt, or modernize existing buildings to bring them up to current standards, including energy efficiency standards.

SEAI: Sustainable Energy Authority of Ireland

SMART Diagram: Simple Multi-Attribute Rating Technique. The process enables evaluation of options against identified project objectives, weighted for relative importance, in order to facilitate decision making where fundamental choices must be made.

SME: small and medium sized enterprises, as defined in EU law: EU recommendation 2003/361. The main factors determining whether a company is an SME are the number of employees and either turnover or balance sheet total.

Company Category	Employees	Turnover	or	Balance Sheet Total
Medium-sized	< 250	≤ € 50 m		≤ € 43 m
Small	< 50	≤ € 10 m		≤ € 10 m
Micro	< 10	≤ € 2 m		≤ € 2 m

These ceilings apply to the figures for individual firms only. A firm which is part of larger grouping may need to include employee/turnover/balance sheet data from that grouping too.

The Association for the Conservation of Energy: represents United Kingdom companies and other organisations engaged in energy conservation. It aims to encourage a positive national awareness of the need for and benefits of energy conservation, to help establish a consistent and sensible national policy and programme, and to increase investment in all appropriate energy saving measures. **www.ukace.org**

The Efficient House standard: as defined in Germany an “efficient” new home consumes 55-94 kWh/m^2 per year.

The Minister: for Communications, Energy and Natural Resources, Pat Rabbitte TD 2014

The Whole House approach: to energy conservation refers to measures covering all major elements of the building envelope and energy systems.

CONTENTS

1 ACKNOWLEDGEMENTS

Gerhard Lutz Dip Ing (fh) timber engineering, construction biologist sub. Professor timber engineering, for his inspirational lectures on building physics; structural mechanics; energy efficient construction and refurbishment of residential buildings; retrofit of public buildings; hybrid buildings; retrofit with timber frame walls; adding an additional storey; fire resistance and sound insulation. In particular the humor he brought to the lectures and for his genuine personal commitment to environmental issues and the reduction of co_2 emissions.

Achim Dangel MSc, Master Carpenter, Low Energy Consultant and Passive House Designer.
He was Team Germany's construction leader and winner of the 2009 Solar Decathlon held in Washington D.C., which challenged 20 student teams to design, build, and operate the most attractive and energy efficient solar powered house. We thank him for his energy, enthusiasm, expertise and eagerness to pass on his wealth of knowledge and experience, which included Passive House construction in Ireland. His lectures covered: airtightness and diffusibility; timber construction systems, timber products and practical experience of retrofitting.

Other lectures to be thanked are:
Markus Kammerer Dip Ing: Retrofit of Building with Masonry Walls.
Thomas Jörger, Architekt, BDB Energieberatung: Planning of Modernisation
Gunter Lindemann Dip Ing: Building Climate Control
Markus Weitzmann: Airtightness Testing and Quality Assurance
Björn Peters Dip Ing (FH), M.Sc: Ventilation Systems
Markus Brunn Dip Ing: 3D Laser Scanning

Special thanks go to the course administrator Anna Strahl for making our weeks in Germany so easy and enjoyable, with our every need taken care of.

Special thanks also go to our German language and cultural studies lecturer Jutta Kastner for our intensive 40 hours of tuition at LIT, and moreover for the transformation of the group of individuals into a cohesive group.

To the REMSOB F1 members, listed in Appendix D, for their support with this submission and for making the course and extra curricular activities so enjoyable.

Most importantly, my very special thanks go to Therese O Halloran for her assistance and commitment in trying to make this submission a worthwhile contribution to informing energy policy in Ireland

2 INTRODUCTION: MOVING IN A NEW DIRECTION

"As EU and domestic directives and regulations demand higher levels of energy performance, and with the failure of existing building stock to meet even current building regulation standards, the retrofitting of existing building stock will emerge as perhaps the most significant market for the construction industry in the coming years in Ireland." (Allen C 2014)

To date in Ireland the majority of construction professionals have completed their education with limited coverage of the theory and practice of energy performance and sustainability, as we transition to a low carbon economy, our construction professionals must play an enormous part in this complex picture as we adapt our building stock to become energy efficient.

REMSOP F1 Group **May 2014**
Erecting a new retrofit panel for external cladding application

The REMSOB project is one such example of the emergent professional training programmes available in Ireland at present. The group of 19 construction professionals, mainly architects, together with some chartered building surveyors, chartered quantity surveyors and architectural technologists, travelled to Germany to study Energy Efficient Building Systems at the Centre of Excellence "Kompetenz Zentrum Holzbau and Ausbau". The project administered by Leargas through LIT Tipperary was aimed at facilitating the transfer of knowledge from Germany to Ireland of current best practice and knowledge in relation to the energy efficient refurbishment of multi storey buildings through timber technology.

From this learning platform, the group Remsob F1 continues to support each other in the continuing development of their specialist knowledge, and commits to promote the value of retrofitting existing buildings in Ireland to high energy efficient standards. As a voice, this forum takes the opportunity to respond to the Minister's invitation to participate and contribute as part of the public consultation process for the recent Energy Policy Green Paper 2020.

Our study focuses on possible financing strategies which depart from the existing model within Ireland and which are broadly couched within the following objectives.

1. To highlight international energy efficiency programme funding mechanisms, and to encourage the government to adopt similar practices that facilitate significant demand for the comprehensive retrofit of buildings and homes to high energy efficient standards.

2. To emphasise that the key to meeting and, if possible, exceeding committed targets on CO_2 reductions is through comprehensive retrofit programmes for the public and private sectors. As such, targets, objectives, actions and measurement of performance will have to be focused accordingly.

3. To underline the significant benefit to the construction sector employment levels, and Ireland's domestic economy, if funding mechanisms are established to create the demand for comprehensive energy efficiency retrofit projects.

We propose that only with a dynamic and accessible finance strategy in place can a dynamic retrofit policy be invoked. We believe that only then can Ireland attain the desired equilibrium which urgently seeks to align greenhouse gas mitigation measures with economic recovery. With an army of construction professionals in training and most at the ready, this transition provides a unique opportunity to create economic recovery through the retrofit industry whilst simultaneously fulfilling carbon mitigation commitments. We call on the policy makers to recognise this phenomenon and apply meaningful, if not heroic, effort to take advantage of this situation and break new ground.

3. ENERGY EFFICIENCY PROGRAMME FUNDING MECHANISMS

Buildings are high energy users, producing more than 40% of all CO_2 emissions in Europe. According to Power and Zulauf (2011) they are also relatively easily made more energy efficient with known technologies and have comparatively short payback periods. By review of international energy efficiency programme funding mechanisms, we will highlight models that have performed well; we will also draw attention to problem areas, and encourage government to adopt similar practices that facilitate significant demand for the comprehensive retrofit of buildings and homes to high energy efficient standards.

The IEA (2009) says *"Governments should strive to create enabling environments for private investors through appropriate mechanisms such as risk sharing instruments or preferential rate loans."* They say international financial and economic crises, combined with the volatility of energy prices threaten to jeopardise economic wellbeing. As such governments can, and should, face these challenges by turning them into an opportunity to kick start the long awaited low carbon revolution. Within the recent context of the credit crunch and financial bailouts in Ireland, it all adds weight behind the need to urgently implement the IEA's recommendations.

Energy efficiency programmes are most commonly incentivised in Europe in the form of long term preferential rate loans (and other direct subsidies), wherein the government subsidises the private sector so that financial institutions can offer customers reduced rate loans.

3.1 FRANCE

France, through its Grenelle de l'environnment, is offering zero % interest rate loans for home retrofitting energy efficiency projects together with a tax credit scheme. This was highly successful and has been extended until 2015. Between 2005 and 2010, it benefitted 8 million projects. The objective is to reach 400,000 loans per annum from 2013 onwards (Odyssee 2012).

3.2 JAPAN

The Flat-35 developed in Japan illustrates the principle of risk sharing agreements. The government guarantees a fixed interest rate in its loans to financial institutions, which in turn provide a fixed and reduced rate of interest to their customers in exchange for an energy consumption reduction certificate. Initiated in 2003, this scheme led to the refurbishment of over 100,000 dwellings in 3 years. Staff training and developing expertise at financial institutions was a core element of the success in Japan and France (IEA 2009).

3.3 UNITED KINGDOM

The United Kingdom government's Energy Bill provides for a new Green Deal which they believed would revolutionise the energy efficiency of properties in Britain. Consumers would undertake energy efficiency improvements to their homes, community spaces and businesses with no upfront cost. Payments are recouped through instalments on their energy bills. The Green Deal charge can be seen alongside the reductions in energy use which generate savings on their bill. If the property is sold the financial obligation does not move with them but stays with the property and moves to the next "bill payer": It is not a conventional loan since the bill payer is not liable for the full capital cost of the measures, only the charges due whilst they are the bill payer. This is a market mechanism; funded by private capital, which the government stated *"will deliver far more to consumers than any sort of top-down government programme"* (DECC 2010). The government predicted that the supply chain could support 100,000 jobs within five years, spread across the United Kingdom (DECC 2010).

However, Brignall M (2014) reported in the Guardian major problems with the Green Deal, such that the government, through lack of take up, had to introduce significant new financial incentives. He also reports that the scheme still operates on high interest rates of 6.9%. Schoon N. (2013) in his report "Retrofitting the Green Deal" says the fundamental problem is a funding gap – the table below from the Schoon's report shows this.

GREEN DEAL Occupancy Assessment

Improvements recommended on the EPC

Improvements	Estimated costs	Your household's estimated annual savings	Expected Green Deal repayment in year 1	Green Deal finance
Increase loft insulation to 270 mm	£100 - £350	£17	£21	✓
Floor insulation	£800 - £1,200	£59	£72	✓
Low energy lighting for all fixed outlets	£25	£34	£15	
Heating controls (thermostatic radiator valves)	£350 - £450	£14	£16	✓
Replace boiler with new condensing boiler	£2,200 - £3,000	£96	£122	✓
Solar water heating	£4,000 - £6,000	£25	£35	✓
Solar photovoltaic panels, 2.5 kWp	£9,000 - £14,000	£239	£236	✓
Total	**£16,475 - £25,025**	**£486**	**£517**	

Figure 1 Green Deal Assessment Report …….Schoon (2013)

In Green Deal assessment reports, recommended measures that can be fully financed by the Green Deal (typical first year savings equal or exceed first year repayments) are given a green trick. Those that can only be part financed receive an orange tick, meaning the household would have to make an upfront payment.

Uptake was extremely slow - in the first eight months of the scheme, according to DECC statistics, covering the period up to the end of October 2013, a mere 1,173 Green Deal plans were underway for individual households. Only 219 had actually been completed, with the installation work signed off and the repayments having begun. The slow start was attributed to Green Deal providers being slow to come forward, with the first of them making finance available to households only from May 2013.The biggest problem to emerge was that the Green Deal finance mechanism would only cover a part (and often the smaller part) of a typical household retrofit. Very often, households would have to find much of the money for the installation themselves, defeating one of the Green Deal's founding purposes. Furthermore, the types of measures that can be fully financed by the Green Deal tend to be the cheaper ones and households are loath to enter a loan arrangement with an APR of some 8% lasting at least 10 years in order to borrow a few hundred pounds. For example a boiler upgrade of £2,200 with annual savings of £100 per annum under the "golden rule" formula, a consumer would qualify to receive a loan of £687 over 10 years or £1079 over 25 years when a typical 8 % APR is factored in. So the householder would therefore have to pay for at least £1,121 (or 51%) of the costs of the installation upfront. Also the criteria used to assess the energy and cost saving capabilities of typical upgrades tends to be very cautious and as such yield a lower energy saving per year, reducing the availability of loans (Schoon 2013).

Schoon says there are three essential ingredients to fix these problems: cut interest rates, encourage households to enter into the Green Deal without using Green Deal finance and develop a significant, long term incentive for home retrofits. He concludes *"If Britain's millions of energy wasting homes are to cut their bills and carbon emissions then we need to be thinking in terms of a home being retrofitted every minute or so. We seem on course to have one or two retrofits every hour."*

On the supply's side of the equation the scheme operated poorly - every installer had to go through a complex accreditation process leading to a low uptake from the contractors, which meant very little choice for the consumers. A small contractor sought a freedom of information request from DECC and established in 2013 that British Gas were securing 95% of boiler installation work.
(Ross-Millar L. 2014)

The government has tried to reduce the red tape: changes include reducing the paperwork that has to be signed by consumers from five forms to just one on a single page; reducing the time it takes to approve Green Deal providers from three months to three weeks; and reducing the data required from consumers to make an application for a plan.

3.4 IRELAND

In the SEAI's 2012 Annual Report, they report following achievements for that year:

Homes:

- Over 26,000 homes availed of €29m of Better Energy Homes grants, with €70m in matched funds being invested by homeowners
- More than 14,000 vulnerable homes were upgraded through the Better Energy Warmer Homes scheme
- Almost 67,000 residential Building Energy Ratings were published

Business and Communities:

- 160 of Ireland's largest energy users in the Large Industry Energy Network achieved energy savings of over €16m
- 32 major organisations signed up to the Public Sector Energy Partnership Programme
- 103 Better Energy Workplaces projects received grant aid of €11.3m, with projected one-year payback on the State's investment
- Sustainable Energy Awards nominees cumulatively saved €28m in energy spend
- 18 communities received grant aid of €1.8m for innovative energy efficiency projects

The SEAI's "Better Energy Homes" scheme allows all homeowners of dwellings built before 2006 to apply for a grant support incentive. Landlords and owners of multiple properties may also apply, however they must submit a separate application form for each property.

The following grants are available to incentivise homeowners:

- Attic insulation €200
- Cavity wall insulation €250

Wall insulation; internal dry lining

- Apartment or mid-terrace house €900
- Semi-detached or end of terrace €1,300
- Detached house €1,800

Wall insulation; external

- Apartment or mid-terrace house €1,800
- Semi-detached or end of terrace €2,700
- Detached house €3,600

Heating

- Heating controls and boiler upgrade €560
- Heating controls only €400
- Solar heating €800

BER

- BER Certificate €50

The minimum grant available is €400 and homeowners are free pick and mix the upgrade works they carry out. A Building Energy Rating (BER) is an integral part of the scheme and must be undertaken by the homeowner on completion of the grant aided works.

A key missing element which could significantly enhance the energy performance of the building stock is having funding support to upgrade the glazed elements of buildings with energy efficient units. In Germany tripled glazed windows to "Passive House" standards are as low as 0.123 W/m²K. The SEAI's website refers to double glazing achieving 1.2 W/m²K and triple glazing 0.6 W/m²K. Thus glazing is a major opportunity to improve the overall energy efficiency of the building.

The government's Home Renovation Incentive scheme[1] provides tax relief for homeowners by way of an income tax credit at 13.5% of qualifying expenditure on repair, renovation or improvement works carried out on the homeowner's main home by qualifying contractors. The amount of the HRI tax credit depends on the amount spent on qualifying works. Tax relief can be claimed on qualifying expenditure over €4,405 (before VAT at 13.5%). This €4,405 (before VAT) can be the total from any number of jobs carried out and paid for from 25 October 2013 to 31 December 2015. While there is no upper limit on expenditure on qualifying works, the tax credit will only be given in relation to a maximum of €30,000 (before VAT at 13.5%). However, qualifying expenditure (over €4,405 plus VAT) will be reduced by 3 times the amount of any grant incentive for the works.

Looking to the future, the government has stated its intention in NEEAP 2020 to establish a national Energy Performance Contracting (EPC) process to deliver innovative models of retrofitting and financing of energy efficiency measures in the commercial and public sectors. The government says the EPC framework will provide an integrated resource to public and commercial organizations that want to implement energy saving retrofit projects using EPC or non Exchequer financing. Among the key deliverables are the development of standard documentation and model contracts. They state their objective will be to build capacity amongst organisations for which EPC will become their preferred method of procuring and implementing energy saving projects.

The NEEAP 2020 programme commits to the rollout of a Pay-As-You-Save (PAYS) scheme after 2013 to enable the home energy efficiency programme to continue **without recourse to public funding**. PAYS is a financial model that would allow energy consumers to finance energy efficiency upgrades through the energy savings generated. The Department is working with other government departments, the SEAI and the utilities and financial institutions to develop proposals for the introduction of a national PAYS scheme in line with this timeframe.

[1] http://www.revenue.ie/en/tax/it/reliefs/hri/hri-general-faqs.html#section1

3.4.1 CONCLUSIONS (IRELAND)

In Table 1 below we set out our primary concerns. Boxes shown in 'GREY' throughout the submission highlight negative aspects that need to be changed or avoided. 'Light Green' boxes highlight positive action that should be taken.

We have four primary concerns with the current position in Ireland set out above:

1. The current grant system does not recognize the importance of utilizing energy efficient glazing as a key measure to improve the energy performance of a building.
2. The grant system does not facilitate the Whole House approach to retrofitting.
3. The PAYS scheme (Green Deal) adopted in the United Kingdom, initially without recourse to public funding, has not worked and thus should not be the basis of Ireland's model (refer to section 3.3 above and section 3.6 below).
4. The government annual funding levels (€42.1 million for 2012) is significantly short of what is required to create a dynamic retrofit market that will achieve the government's CO_2 emission targets for 2020.

Table 1; Conclusions Existing Irish Energy System

3.5 THE GERMAN MODEL

The German funding mechanism has proven very effective at overcoming financial barriers and creating an energy efficiency market for the implementation of projects (IEA 2009).
It is the most established funding system worldwide for energy saving projects, and as such we have examined it in more detail. KfW, Germany's major public investment bank offers financing for energy conservation and renewable energy projects. The bank was set up following World War II and backed by major German banks to oversee the large flow of American post war investment in Germany's infrastructure, housing, and industry. KfW has continued as a public investment bank, facilitating the financing of energy conservation and renewable energy. Since 1990, three forces drive German government action: legislation to save energy and generate renewable energy; subsidies and loans (mainly via KfW) to finance CO_2 reduction programme; and advocacy and technical advice to drive energy efficiency via the Deutsche Energie Agentur (DENA) and linked regional bodies. Multilayered programme with incentives, information, and advice channels have created widespread public awareness and action to cut energy use. According to Power and Zulauf in their 2011 report[2] their research demonstrates that the German experience proves that a stronger economy can go hand in hand with reducing the threat of climate change.

[2] Power A. and Zulauf M. Report, 2011: Cutting Carbon Costs: Learning from Germany's Energy Saving Programme

Germany ranks top among EU countries in renewable energy production and plays a leading international role in promoting buildings' retrofitting to save energy. Its renewable energy industries are fast growing, internationally oriented, and job intensive. Germany's economy shrank by 5% during the worst year of the recent financial crisis (2009), but its renewable energy and energy conservation industries showed strong growth (20%) in the same year. At present German renewable energy technologies are one of the country's fastest growing exports. For each euro the German government has invested in grants and subsidies for energy efficiency, €9 have been attracted in loans – thus the German government's current annual investment of €1.4 billion is generating a retrofit market of €14 billion. In addition, owners have invested their own personal savings. Repayable loans via KfW recirculate into new finance thus boosting the amount of currency in circulation. At the same time, a million new jobs have been created since 2006, CO_2 emissions have fallen steeply, and 9 million homes have cut their energy use by 40% or more (Power and Zulauf, 2011).

Between 2006 and 2011, Germany has created nearly 500,000 new jobs in renewable energy and nearly 900,000 jobs in retrofitting homes and public buildings. Green investment, green technology development and export are all now major growth areas in Europe's strongest economy (Power and Zulauf 2011).

3.5.1 FUNDING MECHANISM

Power and Zulauf (2011) detail the German funding system. The federal government sponsors KfW funding streams for energy efficient refurbishment under the CO_2 Building Rehabilitation Programme. The value of the loans, subsidies, and repayment levels is based on the value attached to regulatory energy efficiency standards. The energy use level advocated for new buildings in 2011 is 55-94 kWh/m^2 per year and is given the baseline of 100. An "efficient" new home consumes 85% of the baseline (that is, at least 15 % less energy than the baseline of 100), and a "passive" new home consumes 40% of the baseline of 100. Such energy efficient homes require innovative heating technology using renewable energy and the highest possible level of thermal insulation. They are therefore considerably more expensive than average new homes (see Table 2 below).

Details of KfW Loans Available for Remodelling Residential Housing at Different Levels of Energy Efficiency

Loans are available for up to 100% of the investment cost, including additional costs for an architect or an energy conservation consultation, depending on the planned energy efficiency. Generally, the Whole House approach is funded more than individual measures or combination of individual measures and is incentivised accordingly:

- Maximum €75,000 per housing unit for Efficient House standards (a comprehensive approach). Bonuses are applied to homes that achieve an efficiency of 85%

- Maximum €50,000 per housing unit for individual or combined measures. A combination of KfW loans and other funding in the form of loans, grants, or subsidies is allowed so long as the total amount does not exceed the total expenditure. Loans last for 10 to 30 years.
- The higher the energy improvements, the lower the interest rate. For the Efficient House the interest rate is fixed for the first 10 years.

Owner occupiers, landlords, and buyers of newly refurbished residential units, including individuals, housing companies, housing cooperatives, municipalities, district bodies, community groups, and other public or non profit bodies, are eligible for the loans.

KfW Investment Subsidies by Energy Efficiency Levels

Subsidies are available for remodelling to meet Efficient House standards and also for individual and combined measures. Subsidies cover a percentage of the costs over €300. The higher the standard of energy efficiency retrofit, the greater the subsidy.

Efficient House Standard	Investment Subsidy %	Max Subsidy per Housing Unit
130 (72-121 kWh/m^2)	10	€7,500
115 (63-108 kWh/m^2)	12.5	€9,375
100 (55-94 kWh/m^2)	17.5	€13,125
85 (47-80 kWh/m^2)	20	€15,000
Individual measures:	5	€2,500

Table 2 Investment Subsidies by Energy Efficiency Standard

A retrofit to “efficient” house standard qualifies for the highest subsidy of 20%.
Retrofitting to the baseline standard qualifies for a 17.5% subsidy.

Subsidies are available regardless of an applicant’s income. Applicants qualify so long as they fall into the group of persons or housing units requiring energy efficient investment (that is, owners of 2, 3 or 4 family homes) for rent or personal use; to purchasers of newly refurbished one or two family units; to owners of apartments within cooperatives (for rent or own use); and to owner occupied cooperatives. Larger landlords and landlords of multi-unit buildings are eligible for loans. Applications require a certificate from an approved and certified energy adviser. Houses in conservation areas or that are protected (listed) because of their special significance can be exempt from some technical requirements. Exemptions must be approved by the German Energy Agency (DENA) and include a statement from the conservation authority confirming the conditions attached to the refurbishment.

KfW Special Support for Specific Energy Saving Functions

Additional special support subsidies are available:

- To cover 50% of the cost of expert advice on technical building issues during the refurbishment phase, with a maximum grant of €2,000 per measure.
- To dismantle and dispose of night storage heaters (€150 per storage heater)
- To upgrade existing heating systems (25% of the cost).

These subsidies are available for Efficient House renovation, and also when more than one energy saving measure is adopted, payable for costs above €150.

KfW Loans for non-residential units

Energy efficient refurbishment by municipalities:
Loans are restricted to local government and their legally related organizations and community associations.

Social investment loans for energy efficient refurbishment
These loans are restricted to non-profit organizations, including churches:

- For refurbishments meeting the Efficient House standard and for individual and combined measures, loans are available.
- Refurbishments meeting Efficient House standards can receive a maximum of €350/m². For individual measures, funds are available up to €50/m². For a combination of at least three measures, loans are available for up to €200/m². For more than three measures, an additional €50/m² for each additional individual measure can be obtained.

3.5.2 THE FUNDING PROCESS

Instead of all decisions being made at the centre, they are facilitated throughout the country at the property owner's own bank. The loan element and subsidy are dealt with in the one application.
An independent qualified and registered energy adviser confirms the applicant's CO_2 savings. The borrower's local bank submits the application to the KfW with the CO_2 certificate, on behalf of the borrower. The KfW checks that the technical specifications meet the requirements of the specified programme and sends a confirmation of the loan to the borrower's bank, which is legally responsible for the agreed loan. The borrower's bank uses the credit approval to draft a loan contract with the client. The borrower's bank receives the money from the KfW within 12 months of receiving the loan approval, although an extension can be granted for up to 24 months if necessary. The loan must be used either in full or part within 3 months of receipt.

3.6 ANALYSIS OF FUNDING MODELS

We consider the German model to be simple and efficient. It is a one-stop shop for the borrower. The decision to grant the loan comes directly from the home owner's own bank. The federal government have empowered individuals to make their own energy investment decisions and it is clearly working. The strong focus on refurbishing residential homes to high energy efficient standards began in 2006, supported by €1 billion plus per year in federal funds with current budgets exceeding €1.4 billion generating an annual retrofit market of circa €14 billion. The German model has been hugely successful both in achieving significant reductions in CO_2 emissions and in creating new jobs.

The German model, with its holistic approach to retrofitting and the substantial subsidies and incentives, has a track record of proven success. Notwithstanding this, the United Kingdom model has the major benefit of the loan staying with the property and passed on to the new owners if it is sold. The commonality amongst the proven systems followed in Japan, France and Germany is that they all offer long term finance with some form of subsidised element. They are all creating significant demand for energy efficiency projects and positive results have been achieved. In the United Kingdom, the Green Deal offered long term finance but did not initially offer a subsidised element, and the government's anticipated targets floundered. They have now since introduced subsidies (or incentives) to try to reignite their energy efficiency retrofit programme. It is therefore very concerning to note the Irish government's intention (as shown in section 3.4 above) to try to enable the post 2013 home energy efficiency programme to continue **without recourse to public funding**. We strongly believe that this is a recipe for failure.

We recommend that long term funding is sought (see Figure 2) from the European Investment Bank to facilitate the subsidisation of an ambitious retrofit programme to meet the government's stated CO_2 emission reduction targets. Matching funding should be provided from the government's €6.8 billion Ireland Strategic Investment Fund (ISIF), which was announced open for business on 5th March 2014 to investing in Ireland on a commercial basis to support economic activity and employment. If the success of the German model is replicated in Ireland, a €200 million annual investment should be able to create a €2 billion annual retrofit market and create upwards of 30,000 new jobs in the construction sector. Even if the €200 million investment was only half as successful as the German model, a €1 billion annual retrofit market would create circa 15,000 new construction jobs. In Germany from 2006–2011 an average annual investment of €1 billion in five years created 900,000 retrofit jobs and 500,000 jobs in renewable energy (Power and Zulauf, 2011). On this basis our predictions for Ireland, based on the €200 million annual investment would seem cautious.

We feel there are clearly major lessons to be learned from the United Kingdom model – primarily in avoiding the mistakes made with the Green Deal system, namely: its lack of subsidy, high interest rates and high degree of complexity. It is therefore a concern to note the government's plan for Ireland is to try to enable its home energy efficiency programme to develop without recourse to public funding.

Like the current fragmented system in Ireland (section 3.4) the United Kingdom system similarly allows consumers to pick and mix the elements they upgrade rather than taking the German Whole House approach shown in section 3.5.1, which has proved to be so successful there.

To encourage a Whole House approach to energy efficiency retrofit upgrades and to avoid the fragmented approach that is facilitated through the United Kingdom model and the SEAI's grant system, we feel homeowners should be encouraged and incentivised to employ building professionals. This would also minimise the significant risk of damaging the building's fabric through ill conceived upgrades and will also ensure quality is achieved through the certification process. One way of doing this might be to allow building professionals to charge the lower 13.5% VAT rate where the services are in conjunction with an approved retrofit contract.

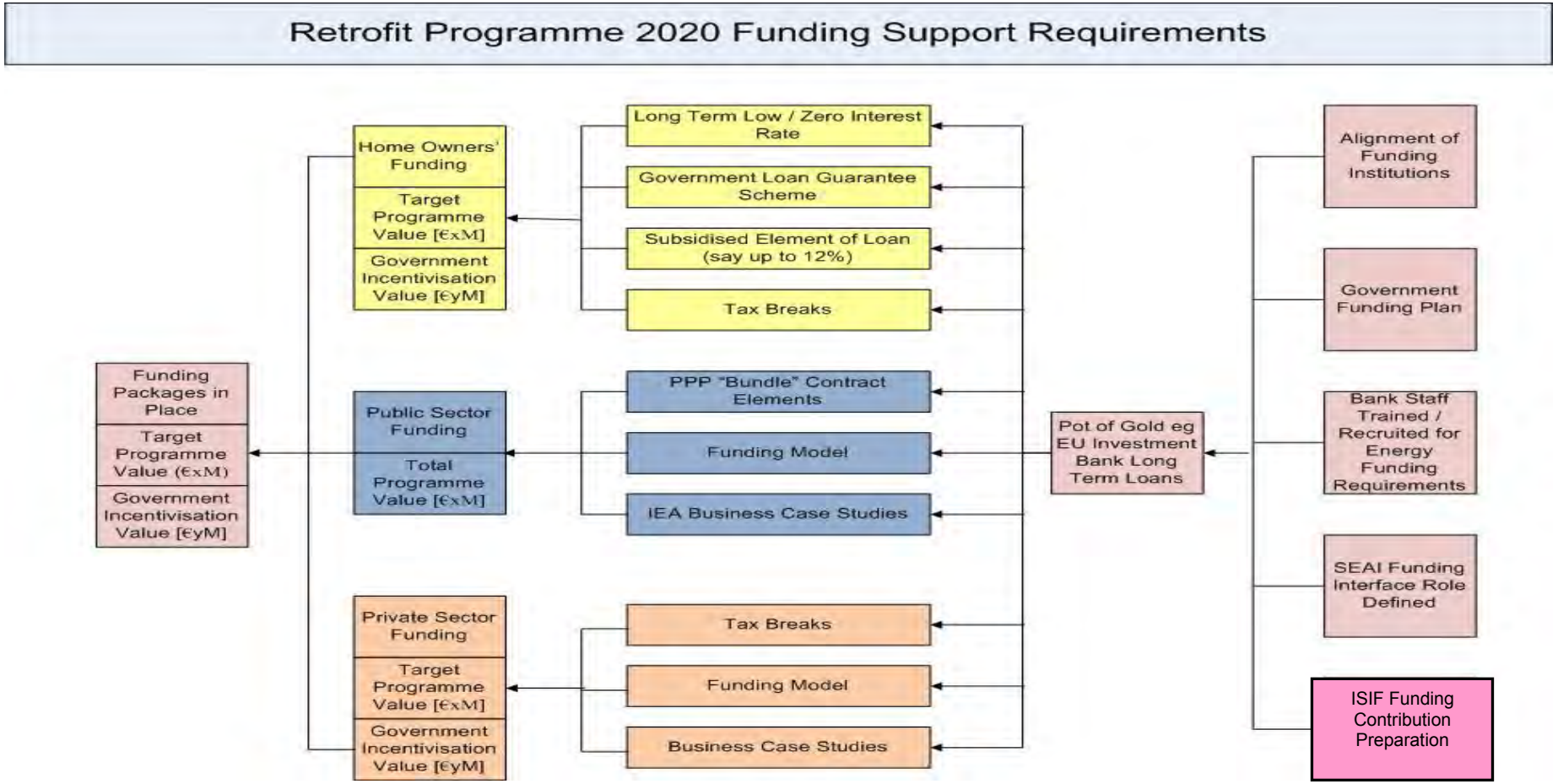

Figure 2 Retrofit Programme Funding - Support Requirements Andrew Warren 2014

This smart diagram summarises the type of funding mechanism and support actions that we recommend need to be put in place by the government to incentivise the retrofit market. The public sector models for social housing and public buildings will be more complicated and require an expert team, such as the proposed EPC to facilitate them with the development of business case models, contracting templates and PPP bundles and the like.

4.0 MEETING CO2 REDUCTION TARGETS THROUGH RETROFITTING

Based on the examination of the German, French, Japanese and United Kingdom models, we conclude that the key to meeting and, if possible, exceeding committed targets on CO_2 reductions is through comprehensive retrofit programmes for the public and private sectors. As such, targets, objectives, actions and measurement of performance will have to be focused accordingly.

We recommend that the government should establish a more prominent commitment to retrofitting existing buildings and supports this with appropriate funding mechanisms.

The European Parliament voted on 14 March 2013 for an 80% cut in energy used by buildings by 2050 compared to 2010 levels. The 'own-initiative' report on the European Commission's Energy Roadmap 2050 was adopted in plenary of the European Parliament following a vote in the ITRE Committee on 24 January 2013.

Based on current technologies, retrofitting could readily cut energy use by 60%. For example, a large family home constructed between 1994 and 2004 would typically have a C3 BER. If this was upgraded to just a B1 rating, this would reduce CO_2 emissions from 12.7 tonnes to 5.0 – a reduction of nearly 61%. This would result in a saving in heating costs of €2,600 (SEAI 2012). If the same home was upgraded to an A3 rating the saving would be 67.7%.

A pre 1978 home with oil/gas central heating would typically have an E1 BER certificate
Based on figures from the SEAI 2012 Guide (small semi detached house <100m^2).

Annual cost to heat (E1 BER)		€2,300
Retrofitted to A3 BER	Cost to heat	€ 470
	Annual Saving	**€1,830**

Appendix A: shows a retrofit to an A3 BER would cost circa €66,000

For ease of calculation: as per the French model; zero % interest over 27.46 years and other subsidies as per the German government incentivisation elements shown in section 3.5.1.

27.5 year loan x annual energy saving €1,830	=	€50,251
€66,000 x proposed subsidy of 17.5%	=	€11,550
25% of heating system costs of €8,513	=	€ 2,128
50% of professional fees of €4,142	=	€ 2,071
Total Retrofit Fund:		**€66,000**

Table 3 Example of Financial Model for small <100m^2 Semi-detached House

In Appendix A we give an example of the likely cost to upgrade a typical semi-detached home from an E1 to an A3 BER, which is €66,000 including VAT and professional fees.

Kochaniuk P. (2012)[3] has produced a comprehensive technical evaluation and financial model for the evaluation of retrofit elements and systems over a 30 year life and funding period. The model allows for additional costs for replacement and repair of items during that period. The design life of fabric upgrade elements is 50 years. Formulaic modeling of interest rates has also been provided for. She concludes: "*In order to reduce the emissions in the quickest possible way to fill the gap recognized in the latest national plan, the government's goal should be to enable the deepest refurbishment."* In that sense she is calling for Whole Building retrofits, an argument we have already made and strongly support.

The higher levels of fabric upgrade, using more insulation on external elements, will ensure higher temperatures of those surfaces and more comfortable distribution of heat. A study considering the performance of the Passive Houses in Europe has shown that occupants' satisfaction with internal temperatures and ventilation system with heat recovery is very high (Kochaniuk P. 2012).

The health benefits of ventilation / heat recovery systems is articulated forcibly by Little J. (2010):

- *"Indoor Air Quality (IAQ) has been cited by the US FHA as one of their top five health concerns.*
- *Ireland has the 4th highest rate of asthma in the world (470,000 diagnosed)*
- *In the northwest maritime regions of Europe IAQ is principally a matter of controlling humidity which otherwise would result in condensation and mould - a cause of allergenic illness."*

For the Irish market to be incentivised on the basis of the government's principle of "Pay as You Save" (PAYS), the level of subsidy will have be sufficient to cover any shortfall in retrofit project costs when the energy savings made over the period of the loan have been determined.

For this reason it is essential that a dynamic market is encouraged with new entrants free to enter reasonably unhindered to avoid the market restrictions that occurred in the United Kingdom that constrained supply and forced up prices and may well be forcing up prices with SEAI's current grant

[3] A Methodology for Evaluation of an Energy Efficient Refurbishment of a Typical 1960's semi-detached Dublin House in Line with Ireland's 2020 National Goals

system. The control elements should be on the basis of appropriate design and specifications being completed prior to tender i.e. in conjunction with the granting of the loan as is the case in Germany, and in the certification of the completed works as required by the current Building Regulations. The Whole Building approach to retrofitting will encourage the involvement of building professionals to design and certify the works. With competent contractors to manage the works, and the requirement of specialists to certify their elements of work under the current Building Regulations, we believe the current legislative system will create the framework for quality to flourish.

Moreover, once the funding mechanism is in place for a Whole Building retrofit package (i.e. the example of the €66,000 funding package above), with appropriate entry requirements for competent builders and contractors to the market to keep prices competitive, consumers will take advantage of the energy efficiency funding package to fully upgrade their properties with perhaps an extension, loft conversion, new bathroom, kitchen etc., thus creating a "sustainable" outlook for Ireland's building stock.

In 2013 the government announced the creation of a new statutory register of builders and contractors which it was said would be in place by 2015 to enable consumers to ensure they hire competent contractors while simultaneously ensuring that all statutory, regulatory and legal requirements are complied with in a verifiable and transparent manner. We consider any additional controls to the energy efficiency retrofit market, over and above the statutory requirements, to be superfluous. More importantly Ireland's new statutory register of builders and contractors needs to have robust training and education standards that underpin the register and define competency, to especially facilitate and encourage the progression of craftsmen into small contractors. The mark of quality in the German system is their "Master" craftsman status and the education and training that supports it. The title is not easily earned, and without that qualification, a carpenter or any other trade for that matter, is not, by law, entitled to set-up in business.

4.1 NEEAP 2020

If, as the Minister stated, in his foreword to NEEAP 2020 that for each GWh drop in primary energy use through improved energy efficiency (equated to circa €70,000 of savings to homes and businesses) why, when retrofitting the existing building stock is the most effective way for Ireland to meet its committed targets on CO_2 emissions, is this not being given the government's highest priority. The Minister also says: *"Given that around 86% of our primary energy is imported; much of this money leaves the Irish economy – which provides a further imperative to act."* Whilst we are aware that new buildings in Ireland are becoming more efficient due to tighter energy performance regulations, they only represent a relatively small percentage of the built environment. Major improvement of the energy performance of the existing building stock will be needed in the future. The Green Paper also asks how we can increase the rate of home retrofit radically and what the government can do to encourage citizens to undertake ambitious home upgrades in large numbers.

4.2 KEY TARGETS

Based on NEEAP 2020 targets Ireland has to save 12,690 GWh in energy use from buildings in the period from 2011 to 2020. Overall energy savings from buildings in the NEEAP proposal are nearly 45% of the overall target reductions, which in its own right is almost a 15% saving in Ireland's energy use by 2020. None of the 6 priority areas mentioned in the Green Paper explicitly covers the requirement to upgrade Ireland's building stock. It is only Action 86 of NEEAP 2020 that refers to this requirement head-on. We would like to see the government's priorities refocused urgently – Action 86 should be Action 1.

Our view is that the NEEAP 2020 targets and actions necessary to achieve the 12,690 GWh reductions in energy use are not sufficiently articulated. There is no clear strategic plan with defined targets for key elements of Ireland's building stock. The following SMART diagram in figure 3 below illustrates a simple but effective way of showing what is required. From left to right we can see the bigger objective – the key target of 12,690GWh. This has to then be subdivided into the three main areas with viable targets for homeowners, the public sector and private sector (commercial and industrial). Targets can then be broken down further, particularly in the public sector, for example clear targets could be set for social housing – perhaps focussing in the multi-storey apartment blocks with the fastest payback times. From right to left it shows the initial leg work that has to be done from Level 1 screening through to review of international best practice and finally scheme design proposals.

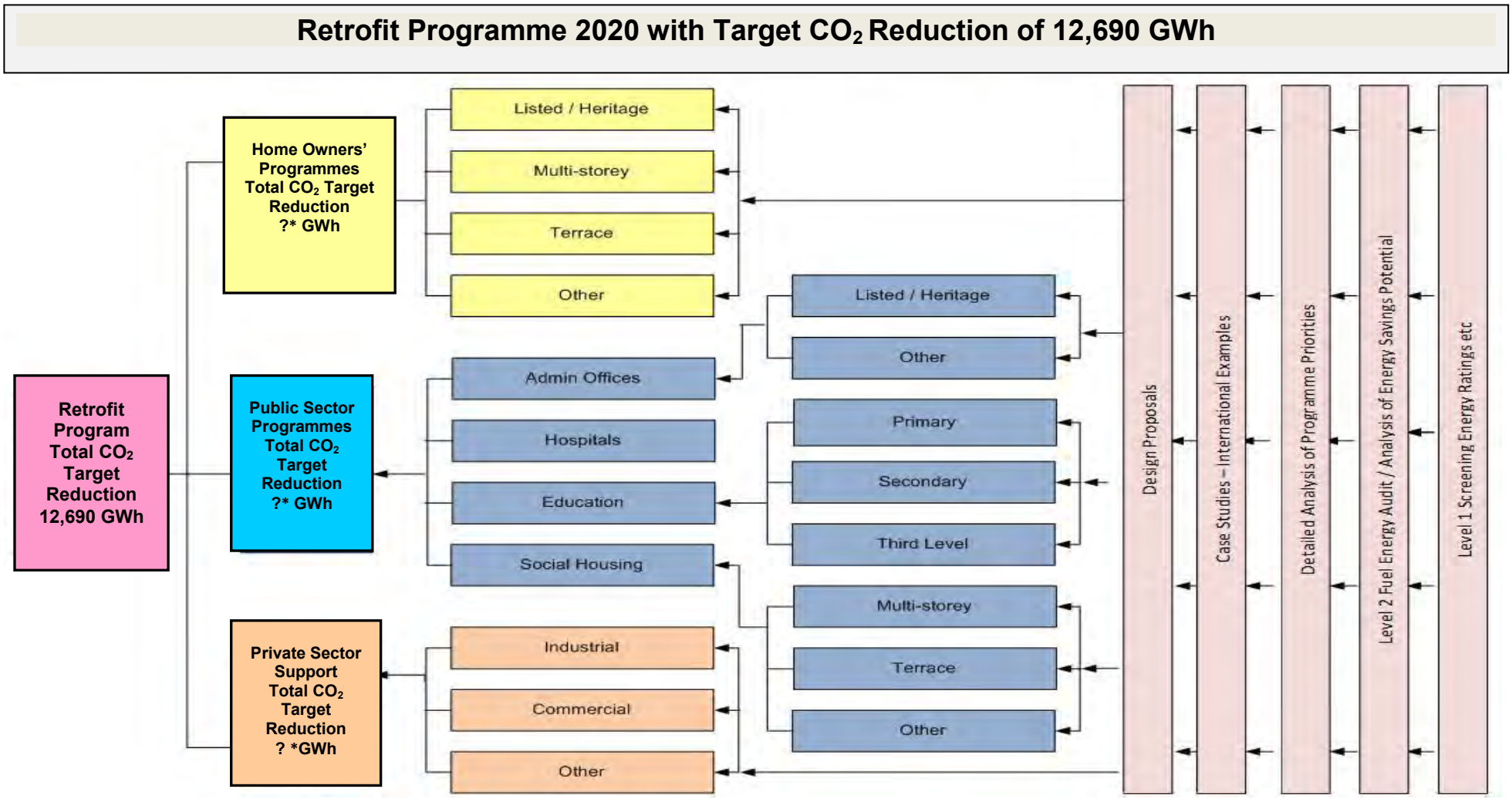

Figure 3 Retrofit Programme 2020 Target CO_2 Reduction - *Amount in GWh to be allocated to each sector. Andrew Warren 2014

4.3 SOCIAL HOUSING TARGETS AND ACTIONS

In NEEAP 2020 Action 77, local authorities are responsible for the standard and quality of their housing stock, and to ease the financial burden the DECLG has allocated capital funding towards upgrading the performance of social housing. It says: *"The energy efficiency target to be achieved by these dwellings is **C1** on the Building Energy Rating certificate for the dwelling, though the extent of funding is tied to the overall energy savings achieved."*

> The C1 BER does not match the aspirations of NEEAP 2020 in using the Public Sector as an example to other sectors, or achieving the aim of radically improving existing buildings. Furthermore the low aspirational C1 BER target does not afford significant energy savings and thus the funding is constrained from the outset. Clearly if the government were to set the target of an A3 BER Certificate, significant energy savings could be made to justify a higher standard of retrofit.

The example shown earlier in section 4 shows how a higher level of retrofit would generate the energy savings to contribute significantly towards paying for itself. The model would have to be adapted for tenants who might, for example, pay a higher rent, but not above the annual energy savings achieved. Clearly the government would have to develop a specific business case model for this sector with some element of the funding coming from tenants' energy cost savings.

4.4 ACTION 86 AND THE ROLE OF THE SEAI

We would argue that Action 86 should be Action 1 and that a significant number of the other actions in NEEAP 2020 should be sub actions to support this.

Action 86 says: *"We will ensure that the Better Energy Programme will upgrade Ireland's building stock to high standards of energy efficiency, thereby reducing fossil fuel use, running costs and greenhouse gas emissions."* The key objective being to deliver energy efficiency upgrades to 1 million residential, public and commercial buildings by 2020, and realise 8,000 GWh of energy savings over the lifetime of the programme (2011–2020). However, this target figure would appear to conflict with the key target given in NEEAP 2020's executive summary, which aims to save 12,690 GWh in energy use from buildings for the period from 2011 to 2020.

It says that the National Upgrade Programme will build on SEAI's successful domestic grant programme and will take the scale of activity to *"an unprecedented level"* with the SEAI in an oversight role to ensure quality and confidence as the new markets build. The Better Energy Programme is supposed to change the way that SEAI delivers high volume supports to energy efficiency activity in all sectors, and is to bring all work under a "*one umbrella scheme"*, with a harmonised approach and a unified and easily identifiable brand, with delivery by energy suppliers.

In section 3.3 above we noted how poorly the United Kingdom government's new PAYS scheme (Green Deal) operated, with every installer having to go through a complex accreditation process, which inhibited the market place giving little choice for consumers. Consumers also had to complete five separate complex forms before upgrade projects were sanctioned. The first year of the Green Deal's operation has been a complete failure resulting in the United Kingdom government now back pedalling by offering new incentives and streamlining procedures. Our fear for the Irish model is that the proposed one umbrella scheme may impede the potential market and care has to be taken to avoid this.

In Germany retrofit projects are dealt with locally at the property owner's bank. The loan element and subsidy are dealt with in the one application. We believe that this should be the model for Ireland. We believe the SEAI role should be less central to the finance arrangements, but more related to checking performance quality in terms of applicants and suppliers meeting technical specification requirements of the government's home energy efficiency programme. The SEAI would then send a confirmation of their acceptance to the borrower's bank that the work specifications are acceptable. We suggest that the SEAI's acceptance of the work proposals could be the basis of a government loan guarantee (as per Japan's model) and also sanction the subsidised element of the loan where the SEAI would transfer the monies directly to the borrower's bank on the certified completion of the works. The borrower's bank would be legally responsible for the loan and would have to undertake reasonable "due diligence" checks to ensure the loan was viable.

Action 86 is the primary action to address the CO_2 reduction targets in NEEAP 2020 and should be prioritised accordingly. It should be the primary action and a hierarchy of objectives similar to the Smart diagram shown in Figure 2 should be established to support the stated goal of "*retrofitting a million buildings"*. There is no doubt that to facilitate this type of ambition the government will need to start to urgently employ programme and project management techniques to drive this ambitious programme forward. We also suggest that a year by year roadmap from 2011 to 2020 is established identifying achievable yearly targets and monitoring and publishing its progress. The immediate priority being to establish viable funding models and supports as examined in section 3 above and as shown in Figure 2. Retrofit Programme Funding - Support Requirements (page 23).

4.5 PUBLISHED ENERGY PERFORMANCE TABLES

NEEAP 2020 says: *"We will introduce a series of obligations on public-sector bodies to address consumption, procurement and reporting of energy use."*

To create awareness and ownership of energy efficiency issues within government Departments, we would like to see the immediate requirement for the government to produce and publish clearly defined energy performance tables for each Department's property portfolio.

Quite simply *"what you don't measure doesn't get done!"*

The proposed content of such a table is outlined in Figure 4 below. We propose that the tables should be "base lined" at a defined date, i.e. January 1st 2015 and should be updated and published annually to monitor progress in the reduction of energy usage. The new position should always be compared with the "baseline".

PUBLISHED PERFORMANCE TABLES FOR GOVERNMENT DEPARTMENTS
"OWNED PROPERTY TABLE" TO COMPRISE THE FOLLOWING INFORMATION:
• Building name, address and reference
• Date of construction, Floor area (m²), Total no. of staff etc.
• Staff / Floor Area Ratio
• DER (Display Energy Rating) Cert Reference No.
• DER Cert Energy Performance Rating
• Heating/cooling cost per annum
• Other energy costs per annum
• Total energy costs per annum
• Total CO2 output
• Planned retro-fit / other action
• Planned energy reduction costs for the next 12 months
"LEASEHOLD PROPERTY TABLE" TO COMPRISE THE ABOVE INFORMATION PLUS:
• Next Rent Review date
• Next Lease "Break" Provision
• Lease Expiry Date
OTHER PUBLISHED ENERGY PERFORMANCE TABLES
The obligations imposed above, should be replicated for local authorities, semi-state companies and other state agencies.

Figure 4 Proposed content of Government Energy Performance Tables

5. CONCLUSION

Following the lead from the international models shown, if the government grasps the challenge of introducing an effective funding mechanism that creates real demand for undertaking comprehensive energy efficient retrofit programmes, there will be significant benefit to the construction sector employment levels, and the domestic economy as a whole. Between 2006 and 2011, Germany created nearly 500,000 new jobs in renewable energy and nearly 900,000 jobs in retrofitting homes and public buildings. Germany's current annual investment of circa €1.4 billion in energy efficiency projects has created a retrofit market in the order of €14 billion per annum. Green investment, green technology development and export are all major growth areas in Europe's strongest economy. If Ireland were only half as successful, a €200 million investment should easily create a €1 billion retrofit market and 15,000 new construction sector jobs with it.

The Green Paper asks how we can increase the rate of home retrofit radically. From our study of internationally tested models we can answer this confidently. The answers reside within the scrutiny of both the successful and failed elements of these tested models. The common theme amongst those international models with proven success (Germany, France and Japan) is that they all provide for long term incentivised financing for retrofit upgrades, and do so in a simplistic manner encouraging their citizens to respond on a huge scale. Conversely, the United Kingdom's Green Deal with its lack of subsidy, high interest rates and high degree of complexity has fallen flat on its face, and has just been re launched with new subsidies. It is therefore worrying to note the government's plan to try to enable its home energy efficiency programme to develop without recourse to public funding. We believe that this will quickly end in failure.

The Green Paper also asks what government can do to encourage citizens to undertake these ambitious home upgrades in large numbers. Again, the answer lies in developing a widely accessible funding mechanism that is simple and non-bureaucratic. Ireland has a great opportunity to look at the existing tested models and to adapt and combine the best elements of them. The solution has to be market driven and with ready access to funding from local banks and possibly credit unions, albeit underwritten by government. Funding institutions will have to have their own experts that understand energy financing models, and staff at local branches will have to be trained accordingly. The solution has to easily facilitate Group Schemes (refer to section 3.5.1) to optimise cost and efficiency in the retrofit of apartment blocks, terraced and semi-detached homes. The government also needs to promote the Whole House approach to retrofitting by publicising the significant improvement in comfort levels and health benefits arising from this approach.

The government say they will establish a national EPC process to deliver innovative models of retrofitting and financing of energy efficiency measures in the commercial and public sectors. The government also asks if in the Green Paper are there particular barriers that need to be overcome, such as lack of finance, information, and skilled professionals. There is a significant body of

international examples of best practice and case studies such as the IEA's "EnERGo" toolkit[4], for the retrofit of government buildings. How long will it take to create this EPC process and the organisation to support it. The government, in setting up the EPC, must ensure that it focuses on those elements that cannot be driven by market forces such as social housing and other public buildings - rather than the commercial sector who will soon find their own solutions if they are incentivised.

The Green Paper asks how other countries effectively engaged citizens in infrastructural development and which innovative or interesting approaches could be helpful in Ireland. The German, French and Japanese models have all proven successful with their long term loans and subsidies. The United Kingdom model failed on account of its high interest rates, lack of subsidy and its complexity. The Irish government has to ask itself whether it has any chance of achieving the 12,690 GWh saving in energy use from buildings by 2020 without a viable funding mechanism being urgently put in place.

We believe the funding institutions should be given the lead role – with loans being made available at local branches. The SEAI should have a similar role to that of the German KfW bank, where they check that the technical specifications meet the requirements of the government's home energy efficiency programme. The SEAI would then liaise with the borrower's funding institution and confirm their acceptance of the proposed works. We suggest, this could possibly guarantee the loan (as per Japan's model) and sanction the subsidised element. The SEAI would be responsible for transferring funds for the subsidised elements directly to the borrower's funding institution on the certified completion of the works. The funding institution would be legally responsible for the agreed loan.

[4] http://www.annex46.de/toolkit_e/it-toolkit.zip

5.1 OTHER IMPEDIMENTS

We believe that the piecemeal delivery of separate elements of refurbishment currently available is not conducive to the activation of an effective large scale retrofit programme in Ireland. A current impediment to the public undertaking *"ambitious home upgrades"* is the SEAI's grant support programme. Attic insulation, wall insulation, high efficiency boilers, heating controls upgrade, solar heating and Building Energy Rating (BER) Certificates are all available on a fragmented basis, rather than addressing a complete retrofit package of works. A key element which is missing that could significantly enhance the energy performance of the building stock is having funding support to upgrade the glazed elements of buildings. In Germany triple glazed windows are as low as 0.123 W/m²K. Glazing upgrades must be done in conjunction with a complete retrofit of the whole building. In this way an A3 BER Certificate is readily achievable. This would now qualify as *"major improvement of the energy performance"* as sought by the Green Paper.

5.2 POLICY AND ACTION PLAN PRIORITISATION

The Green Paper identifies six priority policy areas, the first being *"Empowering Energy Citizens".* The priority one area should be much more explicit – it should be to: *"Upgrade existing buildings to high energy efficient standards"*. The important requirement of *"Empowering Energy Citizens"* is an overarching objective that should sit over all of the listed government priorities.

We believe that Action 86 needs to be reprioritised. It is the core action to address the CO_2 reduction targets in NEEAP 2020. Action 86 should be the primary action and a hierarchy of objectives similar to the Smart diagram shown in Figure 3 should be established to support the stated goal of "*retrofitting a million buildings"*. There is no doubt that to facilitate this type of ambition the government will need to start to urgently employ programme and project management techniques to drive this ambitious programme forward.

5.3 SOCIAL HOUSING PROGRAMMES

The current Social Housing retrofit policy needs to be reassessed. The target of achieving C1 BER Certificate level through retrofit lacks any sort of vision or ambition. The government also say the funding is restricted to the level of energy savings made. If the government were to set the target at an A3 BER Certificate, significant energy savings could be made to justify the additional expenditure required. With a viable funding mechanism in place there is no justification for undertaking half measures. The energy savings can be easily achieved as well as improved comfort levels and health benefits for tenants. These health benefits need to be studied further and cost benefits to the health system should be incorporated into funding models. There is also the opportunity to combine the energy upgrades with a general refurbishment for minimal additional cost.

5.4 OTHER PUBLIC SECTOR PROGRAMMES

We support the government's commitment in NEEAP 2020 to demonstrate the leading role of the public sector in driving delivery of energy efficiency improvements, and to demonstrate the benefits available. It must set out quantifiable and measurable targets to achieve the stated 12,690 GWh saving in energy use from buildings by 2020. There is also the immediate requirement for the government to produce and publish clearly defined energy performance tables for each department's property portfolio. This will create an urgent focus for government departments to act. Furthermore the EED contains a binding measure for member states to renovate 3% of "centrally owned and occupied" building stock per annum over the 2014-2020 period (starting with buildings with a useful area of 500m², extending to 250m² in July 2015).

We feel the government should direct each department to review its property portfolio and prioritise its buildings, with a view to upgrading immediately those properties that are planned for refurbishment and those with the worst energy performance ratings. The minimum target upgrade should be to A3 BER Certificate level. Clearly, obsolescence and rationalisation of buildings will have to be considered in all cases before a decision to retrofit is made. Leases with "Break" provisions should be exercised automatically, forcing landlords to retrofit their properties to re secure the government as a tenant. Likewise for lease expiry dates – lease renewal should not be considered without securing the retrofit of the building.

Buildings are high energy users, producing more than 40% of all CO_2 emissions in Europe. Buildings can be made energy efficient with proven technologies and paybacks can be achieved in a relatively short period of time (Power and Zulauf 2011).

6 CLOSING STATEMENT

The perfect is the enemy of the good (Voltaire 1772). Watson-Watt knew this when he rapidly developed the early warning radar in Britain to counter the growing threat of the Luftwaffe. He propounded the *"cult of the imperfect",* stating: *"Give them the third best to go on with; the second best comes too late, the best never comes"* (Brown L. 1999*).* This means the government has to act quickly and decisively, it must make the correct strategic decisions – the detail can be got right over time. Proper market incentivisation is the key and the United Kingdom's failed attempt without subsidy, high interest rates and complexity has to be avoided. We believe the government's current position of developing the PAYS scheme to enable the home energy efficiency programme to continue without recourse to public funding is fundamentally flawed and failure is inevitable.

With incentivisation in place, home owners and businesses will be able to deliver on their element of the government's targets on CO_2 reductions to achieve the 12,690 GWh saving in energy use from buildings by 2020. We believe this can happen quickly and efficiently if the funding is found to incentivise the market. The public sector funding models for social housing and the like may take a little longer and require an expert team, such as the proposed EPC to facilitate them with the development of business case models, contracting templates and PPP bundles and the like.

The SEAI's fragmented approach to grant aid, which excludes the glazed elements of buildings, is not only a constraint, it could actually be preventing a *"tipping point"* from happening, as home owners may rush to upgrade their properties and replace the often poor quality windows and external doors provided by developers in the past. Clearly this has to happen in conjunction with an holistic approach to the energy efficient retrofit of the building, and engaging building professionals is essential to ensure that appropriate solutions are identified that do not pose a risk to the building fabric.

For the government to achieve its CO_2 emission saving targets, it must make a serious investment and provide realistic subsidies to ignite Ireland's retrofit market. In so doing it can avail of funds from the European Investment Bank. To facilitate this action the government will have to provide matching funding. We suggest earmarking the government's former Pension Reserve Fund (now the ISIF) as a possible resource. If the government were to seize and embrace this, the outcome could be huge employment opportunities, a real boost for the domestic economy and the achievement of targeted CO_2 reductions.

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Perfect is the enemy of good - Wikipedia, the free encyclopedia
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8. APPENDICES

8.1 APPENDIX A: COST MODEL RE SECTION 4

8.2 APPENDIX B: CONTRIBUTORS

8.3 APPENDIX C: REMSOB F1 MEMBERS

8.1 **APPENDIX A:** COST MODEL for SECTION 4

Kochaniuk P. (2012) details a methodology for the evaluation of an energy efficient retrofit of a 1960's semi-detached Dublin house in line with Ireland's 2020 national goals. Specification elements and other data have been used from the report. Cost data and specifications have been modified.

SPECIFICATION

Floor

Existing suspended timber floor replaced by insulated concrete floor. Proposed floor buildup to consist of selected floor finish on 75mm screed (with underfloor heating) on 150mmm concrete slab on 2 layers of staggered insulation (lambda value 0.22W/mK) 25mm min perimeter insulation at external wall face. Allow for continuous DPM/Radon barrier dressed up and sealed to wall face as per applicable floor detail. Min U Value for floor .15 W/m_2K

External insulation

External Wall Insulation (EWI) systems to consist of a 150mm insulation layer expanded polystyrene (EPS) with thermal conductivity of 0.04W/mK for standard white boards, and 0.031 W/mK for grey closed cell boards which are to be used below DPC level. All fixed to the external surface of the wall, followed by a reinforcing mesh and finished with a polymer based render applied to a lighter glass reinforced mesh.

Other finishing options include brick tiles (slips) or other cladding options. In case of masonry with moisture issues, the best application would be mineral wool or natural materials with ability to transfer the moisture to outside.

Attic

Existing ceiling to be removed, new 15mm taped OSB board to provide airtightness. New plasterboard and skim coat. Existing ceiling joists (assumed 110 x 50mm) to be stiffened with 50 x 50mm structural grade timber – glued and screwed at 400mm centres. 150mm Rockwool insulation between ceiling joists. Existing roof tiles (1 m deep) to be removed at perimeter to insulate between rafters at eaves (150mm deep). Continuous 10mm ventilation system to be installed. A second 150mm Rockwool (perpendicular to ceiling joists) to be laid within attic space extending through to the eaves. New uPVC soffit, fascia and guttering to be installed.

Windows and Door Replacement

Correctly installed energy efficient windows not only reduce the use of energy in the house due to smaller heat losses and greater solar gains, but also improve occupants' thermal comfort. The performance of a window is determined by:

- U value and the solar transmittance of the glazing, which is influenced by the number of panes (2 or 3), width of the gap between them, low-e coatings helping to reflect the heat back to the house, the type of gas filling the gap and level of iron content in glass, as it influences light and solar transmittance;
- U-value of the frames, which depends on the material they are made of and its insulation. It is important the frame size is as small as possible, as it always has bigger thermal transmittance then the glazing;
- The performance of the spacer – spacer thermal bridge should be minimized;
- The performance of the installation – to achieve the lowest thermal bridge, windows should be fitted in the depth of the insulation.

Allows for demolition and opening for feature window.

Ventilation

We have allowed for a Whole House MVHR (Mechanical Ventilation with Heat Recovery) which is chosen for optimum performance above, other more manual options could be:

- Intelligent passive stack natural ventilation (IPSV). This has restricted application, because of its dependence on geographical aspect.
- Demand-controlled continuous mechanical extract ventilation (MEV) with humidity controlled vents. This is primarily a humidity driven system with responsive vents to raised humidity levels and provides a cheaper and effective option in suitable applications.

Solar Thermal Panels

Standard propriety system and new 300 litre cylinder. Solar to provide domestic hot water (DHW). Recessed flat plate roof panels (5.61m²) to be fitted in conjunction with the roof works undertaken for the attic insulation works.

Heating System

The proposed new heating system to have a 91% efficient, 8kW regular condensing boiler, with heating controls (energy manager and interlock): 3 zoned timer (water heating and 2 space zones), room and hot water cylinder thermostats, 50mm PIR pipes insulation and hot water cylinder insulation (specific heat loss = 2.5W/K). Underfloor heating to ground floor in conjunction with ground floor insulation works.

Additional Air-tight Measures

Close up all existing open flue chimneys and provide a singular closed radiant fire such as a wood burning stove or similar.

Ensure air tightness measures are executed through careful construction of details in accordance with “Accredited or Approved Construction Details” allowing for all taping and jointing at vertical and horizontal junctions and around perimeters and openings. Such measures should ensure minimum air permeability of 3m³/m²/h.

Optional/Additional

Ground floor modifications (open plan layout) – to improve solar gains.

House Area	[m^2]	88
Floor Area	[m^2]	53.6
Walls Area	[m2]	121.6
Internal Area of Walls (Plastering)	[m^2]	95
Rising Walls Area	[m^2]	13.44
Attic Ceiling Area	[m^2]	44.2
Rafters at Wall Plate	[m^2]	9.5
Modified Roof Section	[m^2]	16.0
Windows and Doors Area	[m^2]	28.1
No. of Openings [pc]		11.0

Table 4 Areas of building elements to which the costs of upgrade elements are applied.

Measure	U-value [W/ m_2/K]	Heating Energy [kWh/m_2/y]	Saved energy [kWh/m_2/y]	Capital Cost [€]	Cost/TFA [€/m_2]	Saved kWh/m_2/y per 1€
GROUND FLOOR: 75mm screed on 150mm concrete slab with 2 layers rigid insulation (W - 0.22 w/mK).	0.11	372	22	€5,500	€62.50	0.44
WALLS: 150mm polystyrene external insulation	0.19	234	160	€12,500	€142.05	1.12
ATTIC: 150mm Rockwool between joists + 150 mm above joists, 150mm between rafters at wall plate (includes roof works	0.17	315	79	€5,000	€56.81	2.68
WINDOWS: Allow for high performance aluminum clad windows such as Nordan NTech 0.7 windows or similar performance quality.	0.66	333	61	€11,500	€130.68	13.00
AIRTIGHTNESS for fabric airtightness at 3 m_3/m_2/h (3.17 ac/h) (2)			13	€3,000	€34.09	0.38
Total Fabric Retrofit			**332**	**€37,500**	**€426.13**	
Mechanical Ventilation Heat Recovery System			34	€3,500	€39.77	
Solar Thermal Panels 5.61m_2 solar - recessed flat panels + 300 L cylinder			20	€5,700	€64.77	
91% efficient condensing boiler 8 kW, 3 zoned timer, room & hot water thermostats + insulation for pipes, underfloor heating system to ground floor.			57	€7,500	€85.23	
Total heating and ventilation			**111**	**€16,700**	**€189.77**	
BER Cert (Before and After)				**€300**		
Total Retrofit excl. VAT			**443**	**€54,500**	**€619.32**	
VAT @ 13.5%				€7,358		
Total Retrofit incl. VAT				**€61,858**	**€702.93**	
Optional/Additional Layout modification – open plan to improve solar gains. Associated Builders Works						
Professional Fees Inc. of VAT at 23%				€4,142		
Total Retrofit Costs				**€66,000**	**€750**	

Table 5 Appendix A – Cost Model for whole house retrofit of a typical small Semi-detached House <100m^2 Gross Floor Area

8.2 APPENDIX B

A special thanks to the following contributors:

Barbara Carr – for her opinions on the first draft and her thorough proof reading and editing suggestions for the penultimate and final versions.

Kevin FitzGerald, Liam Ryan and **Michael Walshe** – for their ideas and suggestions.

Timothy Healy – for his assistance with highlighting problems with the United Kingdom's PAYS scheme (Green Deal), and his follow-up research and analysis.

Declan Lyons, BCT Communications Ltd – for his review of draft submissions and his suggested adjustments.

Annie McCaffrey – for provision and checking of cost data.

Maroon Tabbal – for setting up REMSOB F1's communication links via Linkedin, Facebook and Google pages.

Niklas Weissbrich – for review of the draft proposals and provision of his own research work into retrofitting.

8.3 APPENDIX C

REMSOB F1 is a group of construction professionals, primarily architects, together with some chartered building surveyors, chartered quantity surveyors and architectural technologists, who recently studied and trained in Energy Efficient Building Systems in Germany at the Centre of Excellence "Kompetenz Zentrum Holzbau and Ausbau[5]".

The group members include; Thomas Bourke, Gerard Brady, Barbara Carr, Seamus Carr, Kevin FitzGerald, Declan Gilleece, Nigel Grace, Timothy Healy, Mark Killeen, Annie McCaffrey, Barry O'Connor, Fergal O'Dowd, Therese O'Halloran, Edel Regan, Liam Ryan, Maroon Tabbal, Michael Walshe, Andrew Warren, Niklas Weissbrich, Sinead Wilmott.

ABOUT THE GROUP

Thomas Bourke

Thomas qualified as an architectural technologist in 1995 with his BSc Degree from LIT & Heriot-Watt University Edinburgh Scotland. Since then he has worked for Gilleece Associates Architects, Gibson O Connor engineers & White Young Green consulting engineers until joining Carr Associates Architects in 2000. His experience includes hospitality, commercial, conservation, residential and pharmaceutical sectors. In 2010 he undertook a Post Grad Dip level 9 in Applied building repair and conservation, at Trinity College Dublin. In 2012 he attended a Digital Analysis and Energy Retrofit course, followed in 2013 by a Post Grad Dip in Building Information Modelling Technologies at DIT Bolten Street Dublin, from which he recently graduated. He is currently attending a part time Post Grad Dip in Collaborative Building Information Modelling at DIT Bolten Street, Dublin.

Seamus and Barbara Carr Achitects

Seamus and Barbara studied architecture in UCD and both qualified with B.Arch. NUI in 1982. They started private practice in 1992, providing a wide variety of architectural services including commercial and residential master planning, as well as completing numerous buildings in retail, residential, educational and health care uses, bringing projects from conception to internal fit out and completion. They also have experience as developers, bringing projects from banking through construction and fit out to sale or rental.

Kevin FitzGerald MRIAI

Kevin is an architect in private practice for more than 20 years. Prior to this he was in a large practice in the Munster area as well has having spent time at a number of other practices. During the past 10 years he has had a developing interest in low energy building systems and has increasingly employed these principles in his projects with a particular emphasis on pre-fabricated timber construction.

[5] Kompetenz Zentrum Holzbau & Ausbau, Leipzigstr. 21 88400 Biberach. Centre of Excellence in Energy Efficiency in Buildings, with special emphasis on retrofitting, building physics, energy efficiency, diffusibility and airtightness, ventilation systems and 3D scanning

Declan Gilleece Architect

Declan is a Registered Architect & Chartered Building Surveyor, with RIAI Accreditation in Conservation Grade III, and also a Chartered Environmentalist. He has over 35 years varied experience having worked for large architectural practices, a design and build company and was a part-time lecturer at LIT from 1995-2004. He resided as Past Chair of the Irish Branch of the Chartered Institute of Building (CIOB) and of the Southern Region of the Society of Chartered Surveyors Ireland [SCSI]. He manages a small friendly practice specializing in one-off houses, extensions, conservation reports, defect analysis and reports, and expert witness services. The practice is based in Corbally, Limerick City.

Nigel Grace

Nigel graduated from DIT in 2013 with a BSc (Hons) in Surveying (Construction Economics & Management). In 2006 he received a BSc (Hons) in Construction Economics from CIT with a 1st in his dissertation paper titled "*An Economic Comparison Analysis between Building to a Passive House Certified Standard and in accordance with Part L, 2011 of the Building Regulations in Ireland* ".
He has gained many years' experience in architectural technology and is currently employed as a junior quantity surveyor with Clancy Construction. He commences study for a MSC in Construction Economics this forthcoming October.

Tim Healy

Tim is a recent graduate of the newly established Cork Centre for Architectural Education, run jointly by UCC and CIT. He is currently completing a Masters in Architecture, whilst also working with Reddy O Riordan Staehli Architects, Cork, where he works on a variety of medium and large scale projects predominantly in the public sector.

Mark Killeen

Mark graduated with a BSc (Hons) in Architecture in 2011 and went on to complete a Masters in Architecture in 2013. He gained valuable experience in Christchurch, New Zealand which focussed on sustainable design and the refurbishment of earthquake-damaged buildings. Mark is currently working with Quinn Architects Limerick on a range of projects in the healthcare, educational and domestic sectors. Mark intends to sit his Part III Professional Practice exams in the forthcoming year.

Annie McCaffrey Dip PM, MRICS, MSCSI, MCIOB

Annie is a chartered Quantity Surveyor with 20 years' experience. She is a Member of the RICS, SCSI and CIOB, with a BSc in Quantity Surveying, Diploma in Project Management, Auctioneering & Estate Management and Construction Economics. Annie has experience in all aspects of Residential, Commercial and Industrial Projects. She is currently on the Panel of Assessors for the APC with the Quantity Surveyors Divisions of the SCSI.

Barry O'Connor

Barry graduated from Napier University with a BSc in Architectural Technology (2005). He works with O'Connor + Shanahan architects in Limerick since 2005. His work experience covers an extensive range of sectors including industrial, commercial, residential and agricultural with involvement for all work stages of the project from inception to construction on site.

Fergal O Dowd Architects was established in 2006 by Fergal O'Dowd following nearly ten years in private sector practice in Galway, having qualified from DIT Bolton Street in 1996. The innovative practice provides architectural services for a wide range of projects from one off housing and remodelling to small and medium commercial works and master planning. Recent focus has been on training in energy efficiency solutions for new and refurbishment works. Previous clients include private home builders, developers and local authorities. The practice is fully accredited by the RIAI.

Edel Regan MRIAI

Edel is an Architect with over 25 years of work experience. Graduating with a 1st class honors degree in Architecture from Trinity College, Dublin and DIT, she worked in Dublin, London and Boston. She also worked for a Japanese Architectural and land planning company on large scale urban projects in the US and in Sendai, Fukyama and Osaka, Japan. In the year 2000 she returned to Ireland and set up her own Architectural practice in Cork. Edel has recently spent a year studying environmental engineering at CIT to broaden her skills.

Liam Ryan MRIAI

Liam has been an architect for 23 years and worked in major practices in Liverpool, Manchester, London and Limerick. He set up his own practice in Co. Tipperary in 1998 and has extensive experience in residential, commercial and refurbishment work.

Michael Walshe MRIAI

Michael Walshe graduated from UCD School of Architecture in 1988. The course of his life and architecture has played out in London, New York and Dublin where he worked with A & D Wejchert Architects and Scott Tallon Walker Architects, before returning to the west of Ireland in 2001 where he has since practiced in Galway. Further education includes the RIAI Conservation Accreditation Grade III in 2011, Building CAD with Revit Architecture at LIT in 2013 and REMSOB Certification from LIT (Germany) 2014. Michael believes that architecture, whatever its technology, is a delight if creative, and a suffering if not.

Niklas Weissbrich

Niklas qualified from the BA (Hons) in Interior Architecture, RIBA Part 1 from IT Sligo in 2012. His final year dissertation entitled "Advantages of Existing Building Reuse" he addressed the need to upgrade the Irish building surplus in order to meet set energy targets. Niklas has worked with Clare County Council Planning & Development Department, Healy & Partner Architects, Limerick and currently works with Siobán Mulcahy Architect, Co. Clare .Niklas will commence his Masters in Architecture at Queens University Belfast in October 2014.

Sinead Wilmott, B.Arch (HONS), MRIAI.

Sinead graduated from UCD in 2000 and has gained 14 years' experience in both private and public sector projects including social housing, local government offices and library, HSE offices and residential care centres, plus industrial, retail recreational and educational developments.

The Submission Authors:

Andrew Warren FRICS, FSCS, FCIOB

In 1989 he became Regional Building Surveyor London and South East Region for British Rail Property Board who, at that time, were completing the largest commercial project in Europe, the redevelopment of Broadgate Railway Station. He led the renovation of two major Grade 1 listed buildings, one being the restoration of the St. Pancras Station (roof and facades). In1993, in preparation for the privatisation of British Rail, Andrew moved to Railtrack Plc as their UK Buildings Manager. His immediate priority was to assess the value of its inherited maintenance liabilities for Railtrack's flotation, which was agreed with Government to be £766 million. At the same time he had less than six months to put in place a UK team and contracts to take responsibility for the whole railway estate. Andrew later initiated the station regeneration programme (circa £1.2 billion). In 1996 he moved to Ireland and became an associate of Richard Hurley and Associates (Architects) Dublin and undertook a programme of universal access projects to Government buildings. He later moved to Michael Collins Associates (Architects) to be the Design Team Project Manager for the Four Seasons Hotel Project, Dublin. In 2000 he moved to Iarnród Éireann; he led the creation of its New Works Division and was made its deputy director. In 2007 the Division were successfully delivering €600m programme of authorised projects. Andrew then worked in consultancy on commercial development projects and the delivery of public realm projects across Ireland. Andrew studied at Reading University's College of Estate Management, and completed his post-graduate studies at the University of Limerick. He has published a number of articles on programme management and procurement.

Therese O Halloran Architect MRIAI

Therese studied Architecture at Southbank University London and completed her professional Diploma at UCD Dublin. She has accrued 13 years' experience and worked with a number of reputable firms including Chapman Taylor, Taylor Architects, Scott Tallon Walker and Simon J Kelly Ireland. She set up practice in 2011. Her work approach is informed by a strong focus on all matters energy related which is supported by recent educational pursuits including:

BER Assessor - UCD (2008);

Specialist Diploma in Environmental Sustainability, NUI Galway. (2012);

PG Cert Digital Analysis and Energy Retrofit for Buildings, DIT (2013) and

REMSOB Cert LIT (2014) Germany.

Her current workload deals mainly with refurbishment works including upgrades to existing homes in terms of energy efficiency performance and spatial planning.