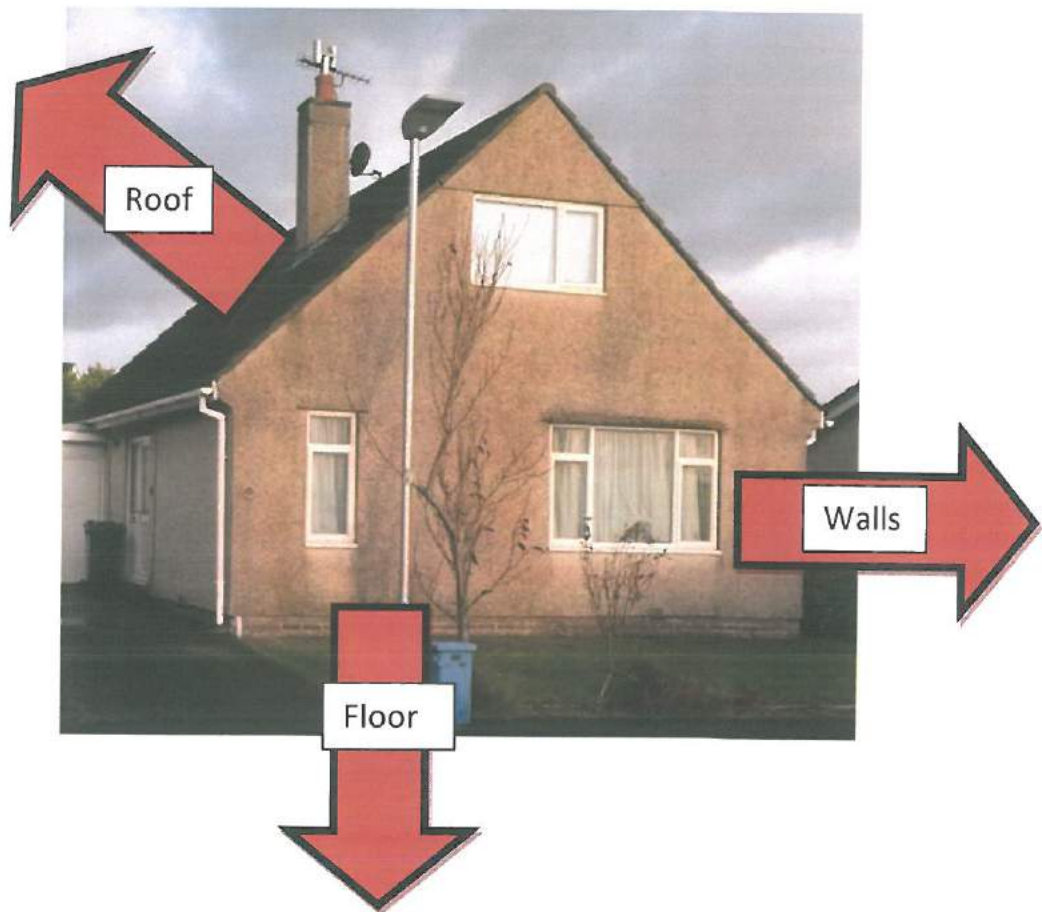


The Retrofit of the Future

“The long term goal is to have desirable, warm, affordable homes for life.”

Main areas of heat loss for average homes.



The aim should be to improve in these 3 areas in the simplest and most cost-effective way.



The Retrofit of the Future

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The Retrofit of the Future

"The long term goal is to have desirable, warm, affordable homes for life."

The house style I have chosen to use is a 1970's property built by McArd or in a similar style. These type of homes can be found in large numbers across the Island for example Close Cam area of Port Erin, Cronk Y Berry area of Douglas, large areas of both upper and lower Onchan and certain areas of Ramsey to name but a few.

We live in one of these homes (this is us below), ours was built in 1974, and we have done all of the work I will be outlining below. We moved in 5 years ago and since then we have changed our house from a cold, draughty and damp home to a warm, dry and cheap to run home. Our home no longer costs £1,600 per year to heat, it now costs just £600 per year. This amounts to a saving of 62.5% of the original heating costs. All of the work was done by on-island contractors so the expertise is already here.



The beauty of retrofitting this type of house is that each estate often had a few standard layouts that were used. The standard styles were used in a variety of configurations in order to create a bit of interest from the outside. Standard room sizes were also used so, for example, if we were to walk into any house in our road we could take a good guess as to the exact size of their rooms based on their configuration.

These are basically all the same house just jiggled around a bit, maybe with the door on a different side, or made into a semi using adjoining garages, or with the whole house turned 90 degrees. It couldn't get much easier to retrofit en masse than to work on this type of house.

Something else great about this type of house is that all of the work that I will be outlining can be done bit by bit so that there isn't a wall of expense for the homeowner to face. They would still benefit from just one or two of the upgrades if they couldn't afford all of them.

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What types of upgrade can be done?

This is the type of work that can be retrofitted to 1970's homes:

Roof

1. New roof tiles, wooden batons, dry-verge, waterproof membrane and insulation.
2. Fix foil insulation inside roof spaces/eaves.
3. Insulate the back and edges of loft/eaves doors and hatches.

Walls

4. Extra insulation for the external cavity walls.
5. Replace UPVC window and door units with Argon gas filled units. Also have all opening windows checked for properly working hinges and latches to ensure no draughts.
6. Fit reflective foil behind radiators on external walls.
7. Upgrade to thermal curtains.

Floor

8. Install under floor insulation to the ground floor and lag under floor heating pipes.
9. Increase the thickness of the underlay.

Other

10. Smart heating system.
11. New more efficient radiators and, where necessary, a more efficient boiler.
12. Convert an open fireplace to a modern and efficient wood burning stove.
13. Install insulated wall and ceiling panels in the bathroom.

The Retrofit of the Future

Roof

Here are the ways you can improve the roof in terms of energy efficiency:

1. New roof tiles, wooden batons, dry-verge, waterproof membrane and insulation.

Reason for upgrade. These houses are about 45 years old. After this amount of time roof tiles need replacing because they become porous and let in water. The original waterproof membrane will also have perished by now. The original concrete verge will be cracked and be letting in water. The wooden batons will be rotten in places, particularly at both ends, due to the ingress of water from the cracked concrete verge. The original insulation is also pitifully thin. The new roof, batons, dry-verge, membrane and insulation will reduce heat loss, reduce water ingress and the resulting problems along with reducing heating bills.

We found that a number of damp problems within our home were fixed after we had the roof replaced, including recurring black mould in one of the downstairs bedrooms.

Will the house use less energy? Yes there will be savings from day one. The home owner would use less oil/gas as the home would retain the heat more.

Will the upgrade cut carbon emissions? Yes.

Will the upgrade save energy costs? Yes.

Is there potential for widespread commercial application on the Isle of Man? Yes. There are currently many trained staff on the Island.

Do the style and overall design fit in the current surroundings? Visually the roof could be replaced like-for-like. The new verge would look different but this type of product is widely used across the island already.

Ease of installation and impact of installation on the householder?

It should take a week from start to finish, weather permitting.

Is it cost effective? Yes. It is cost effective by reducing heating bills and by removing water ingress from properties and the subsequent problems that this causes e.g. black mould or dry rot.

If you pay £10,000 for everything together then the product costs only £222 per year (or 60p per day) for its total lifespan. With economies of scale the cost could be reduced significantly.

Cost of installation £10,000 for everything, or less if you chose to only have some of the work done.

Lifespan of product 45 years

Innovation * featuring new methods; advanced and original.

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This is not new technology but replacing worn-out parts of the roof and using modern waterproof membrane and insulation will have a noticeable effect on the warmth and long term maintenance of the home.

Any potential 'blockages' in taking these concepts to market and how they could be resolved. The initial cost may cause some people to not want to commit to this type of upgrade. We got a second mortgage for £10,000 and found that this was the cheapest and easiest way to pay for it. With the right government subsidy attached and publication of the annual savings that could be made, many more people would hopefully have this work done.

If that doesn't encourage people to carry out the work then you could show them the condition of the tiles, membrane, batons, concrete verge and insulation that's been removed from a 1970's house. They'd see that the tiles were porous and the surface has worn off, the membrane is paper thin and you can just push your finger through it with no effort, the batons will be rotten at each end for about 30cm and at a variety of places across the roof as and where leaks have occurred, the concrete verge will be perished and cracked and finally, the insulation is almost non-existent. They will have much thicker insulation their coat than in their roof at the moment.

2. Fix a layer of foil insulation to give added insulation to the eaves and also prevent any draughts that may be present. Some foils have a special membrane to keep damp out also.

Reason for upgrade. Reduce heat loss from the property.

Will the house use less energy? Yes there will be savings from day one. The home owner would use less oil/gas as the home would retain the heat more.

Will the upgrade cut carbon emissions? Yes.

Will the upgrade save energy costs? Yes.

Is there potential for widespread commercial application on the Isle of Man? Yes. There are currently trained staff on the Island, however, it is quite simple to install so many people could do it themselves.

Do the style and overall design fit in the current surroundings? n/a

Ease of installation and impact of installation on the householder The homeowner would just need to empty their eaves storage and then leave the contractor to get on with it. It is not noisy or particularly time consuming. If a person was installing it themselves all they would need are some large scissors, a staple gun and some edging tape and the willingness/ability to crawl inside the eaves.

Is it cost effective? Yes. The product easily pays for itself within its own lifespan.

Cost of installation Looking on Amazon, the first item that comes up is £63 with no postage charge. This buys you 1 Roll (75cm x 50m or 37.5 sqm) of 3mm double layer heat

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reflector & radiant barrier. It should take 2 rolls to do the average set of eaves for one of these houses. Installation costs are down to who does it as, potentially, installation cost could be £0 if you did it yourself like we did.

Lifespan of product Given that it is installed inside with no exposure to the elements or light, I would hope you'd get 40+ years out of this product.

Innovation This is not new technology but it is not often used in the British Isles due to most people having very little knowledge of it. As well as its insulating properties, it has a 2-in-1 vapour control layer which helps to prevent formation of mould and damp by reducing the risk of condensation. It will also help to keep your home warm in winter as well as cool in the summer.

Any potential 'blockages' in taking these concepts to market and how they could be resolved. It is a relatively unknown product so homeowners would need informing of its benefits, cost effectiveness and ease of instalment. It's a no-brainer once you know about it as it can have the same insulation levels as 4 inches of other types of insulation. For installation you simply cut the insulation to the size you need, staple it to your wall or floor and seal it with tape.

3. Insulate the back and edges of loft/eaves doors and hatches. These areas are often forgotten but are places where a great deal of heat can be lost.

Reason for upgrade. Reduce heat loss from the property.

Will the house use less energy? Yes there will be savings from day one. The home owner would use less oil/gas as the home would retain the heat more.

Will the upgrade cut carbon emissions? Yes.

Will the upgrade save energy costs? Yes.

Is there potential for widespread commercial application on the Isle of Man? Yes. There are currently trained staff on the Island or people could install it themselves. All products can be bought on-island at B&Q.

Do the style and overall design fit in the current surroundings? n/a

Ease of installation and impact of installation on the householder It could take anything from 10 minutes to half an hour for an unskilled person to insulate the back of hatch or eaves door. Any type of insulation can be used on the back of the door and a sticky-backed foam strip can be used around the door edge.

Is it cost effective? Yes. The product pays for itself within its own lifespan.

Cost of installation A few pounds per door.

Lifespan of product Depends on the type of insulation you use but potentially 40+ years, although the foam strips may need replacing sooner.

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Innovation This is not new technology but it is an area of the house that can often be overlooked.

Any potential 'blockages' in taking these concepts to market and how they could be resolved. I can't think of any

Walls

Here are the ways you can improve the walls in terms of energy efficiency:

4. Extra insulation for the external cavity walls. There are two ways of doing this, internally or externally. There are valid arguments for both but as my preference is for external insulation that is what I will focus on.

Reason for upgrade. These houses have empty cavity walls which are not good at retaining heat to modern standards as they contain no insulation. Also, after this amount of time (45 years) the external pebbledash becomes porous which can cause water ingress. The addition of insulation will reduce heat loss, reduce water ingress and its resulting problems as well as reducing heating bills.

Will the house use less energy? Yes there will be savings from day one. The home owner would use less oil/gas as the home would retain the heat more.

Will the upgrade cut carbon emissions? Yes.

Will the upgrade save energy costs? Yes.

Is there potential for widespread commercial application on the Isle of Man? Yes. There are currently trained staff on the island.

Do the style and overall design fit in the current surroundings? Visually the walls will look the same, just newer. As it is installed on top of existing render the external walls will be about 3 inches further out than they were to start with.

Ease of installation and impact of installation on the householder? There will be no disruption within the home. Externally there will be a couple of days where the contractor drills holes into the walls. It should take a week from start to finish, weather permitting.

Is it cost effective? Yes. It is cost effective by reducing heating bills and by removing water ingress from properties and the subsequent problems that this causes e.g. black mould or dry rot.

Cost of installation Up to £10,000 depending on the size of your property. We spent about £8,000.

Lifespan of product We have a minimum warranty of 25 years but the product is expected to last much longer than that.

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Innovation This is not new technology but it is not well known on the island or the UK. We hadn't heard of it until we found out that our neighbours had had it done a number of years ago.

Any potential 'blockages' in taking these concepts to market and how they could be resolved. The initial cost may cause some people to not want to commit to this type of upgrade. We got a second mortgage and found that this was the cheapest and easiest way to pay for it. Also, with the right government subsidy attached and publication of the annual savings that could be made, many more people would hopefully have this work done.

5. Replace UPVC window and door units with Argon gas filled units. The frames do not need to be changed, as long as they are of good quality. Also have all opening windows and doors checked for properly working hinges and catches to ensure no draughts.

Reason for upgrade. Argon filled window and door units keep more heat in your home and massively reduce the amount of condensation you get on your windows.

Will the house use less energy? Yes there will be savings from day one. The home owner would use less oil/gas as the home would retain the heat more.

Will the upgrade cut carbon emissions? Yes.

Will the upgrade save energy costs? Yes.

Is there potential for widespread commercial application on the Isle of Man? Yes. There are currently many trained staff on the Island and Phoenix Windows in Ramsey actually fabricate their own bespoke units for houses with unusual shaped window frames.

Do the style and overall design fit in the current surroundings? Visually the windows and doors could be replaced like-for-like.

Ease of installation and impact of installation on the householder? The quickest we had a new unit fitted was 20 minutes. It is not inconvenient at all, you just have to make a space next to the window on the inside and out in order for the workers to fit the unit.

As long as your window frames are good then you will only need to replace the glass, not the frames.

Is it cost effective? Yes. It is cost effective by reducing heating bills and by removing unnecessary condensation from properties and the subsequent problems that this causes i.e. black mould. The energy rating of Argon windows is 30% greater than regular air filled double glazing.

Cost of installation The cost of Argon filled windows is roughly 5% more than air filled windows. The cost of installation would depend on the contractor but, if someone needed to replace a window anyway, the cost of installation would be the same for an Argon filled window. With economies of scale the cost could be reduced significantly.

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Lifespan of product Same as for standard air-filled window units.

Innovation This is not new technology but replacing ill fitting and draughty units with highly energy efficient ones will have a noticeable effect on the warmth of a home. For those with breathing problems the reduction in condensation, and potentially black mould, could be life changing.

Any potential 'blockages' in taking these concepts to market and how they could be resolved. The initial cost may cause some people to not want to commit to this type of upgrade. However, this is the type of upgrade that could be done one window at a time based on how much the homeowner could afford. This would bring it within the realms of affordability for many more homeowners. Also, with the right government subsidy attached and publication of the annual savings that could be made, many more people would hopefully have this work done.

Also, Argon filled windows are not widely known about as often triple glazing is mentioned as the way to go. When you take cost and heat saving into account Argon filled glass wins hands down.

6. Fit specialist foil sheeting behind radiators on the exterior walls to reflect heat back into the house instead of out through the exterior wall.

Reason for upgrade. The foil sheeting reflects heat back into the room instead of allowing it to be lost through the exterior wall. If you lose less heat then you can have your heating on for less time to achieve the same result.

Will the house use less energy? Yes there will be savings from day one. Radflek reflects back into the room 95% of the heat energy radiated from the back of your radiator and cuts heat loss through the wall and into the outside world by 45%. The home owner would use less oil/gas as the home would retain the heat more.

Will the upgrade cut carbon emissions? Yes.

Will the upgrade save energy costs? Yes.

Is there potential for widespread commercial application on the Isle of Man? Yes, it would take a trained person very little time to fit out a whole house.

Do the style and overall design fit in the current surroundings? n/a

Ease of installation and impact of installation on the householder? The product is so simple to fit there isn't really any need for a professional tradesperson to fit it. It isn't visually noticeable after it's been installed.

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Is it cost effective? Yes. In this style of house it has a payback time of 1.1 years.

Type of Property	Savings per radiator / yr (0.6sqm)	Payback (Years)
Insulated Cavity Walls	£0.80	3.7
Post 1983 Cavity Walls	£1.32	2.3
1976-82 Cavity Walls	£1.91	1.6
Pre 1976 Cavity Walls	£2.75	1.1
Uninsulated Solid Walls	£4.02	0.7

Cost of installation Radflek costs just £21.99 for a 3 or 6 radiator pack or £33 for a 5 or 10 radiator pack (it depends on the size of your radiator how many it will do).

Innovation This is not new technology but it's a very simple way to have a quantifiable and ongoing benefit.

Any potential 'blockages' in taking these concepts to market and how they could be resolved. I can't think of any.

7. Upgrade to thermal/insulated curtains to reduce heat loss through windows. The curtains create a pocket of air between the curtain and the window, blocking the warmth in the room from seeping out through the window. Some thermal curtains include closures, such as Velcro strips, that let you seal them to the walls, making them even more effective.

Reason for upgrade. Regardless of the type of windows you have you will always lose some heat through them. Switching to thermal insulating curtains will reduce the heat loss. Insulated curtains are designed to effectively block the cold outside air from seeping inside your home. They contain a vapour barrier coating, a decorative outer covering and a reflective film layer, which also helps to deflect heat back into the room.

Insulated curtains help protect your home from the four major types of heat loss (conduction, infiltration, convection and radiation) that occur through and around your windows. In other words, insulated curtains help prevent heat from leaving your home.

Will the house use less energy? Yes. The home owner would use less oil/gas as the home would retain the heat more.

Will the upgrade cut carbon emissions? Yes.

Will the upgrade save energy costs? Yes.

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Is there potential for widespread commercial application on the Isle of Man? n/a
It's just fitting a pair of curtains.

Do the style and overall design fit in the current surroundings? Visually the thermal curtains are like other curtains.

Ease of installation and impact of installation on the householder? As simple as putting up regular curtains.

Is it cost effective? Yes. It is cost effective by reducing heating bills and because they can be no more expensive than regular curtains.

Cost of installation n/a as homeowners can install the curtains themselves.

Lifespan of product Same as for standard regular curtains.

Innovation This is not new technology but is a simple upgrade to make when a homeowner is already thinking of replacing a set of curtains.

Any potential 'blockages' in taking these concepts to market and how they could be resolved. None that I can think of unless the homeowner can't find a design that they like.

Floor

8. Install under floor insulation to the ground floor and lag under floor heating pipes. If necessary replace the floorboards too.

Reason for upgrade. These type of houses have suspended floors. This means a big air gap underneath that has vents to the outside to create airflow. As a result, heat is sucked down and out of your house, through your downstairs floor, and lost through the vents to outside.

Also, the under floor hot water pipes in this type of house don't have any insulation on them to speak of. We found that some of ours had a tatty tar-covered rag hanging off them but that was it.

Will the house use less energy? Yes. The home owner would use less oil/gas as the home would retain the heat more.

Will the upgrade cut carbon emissions? Yes.

Will the upgrade save energy costs? Yes.

Is there potential for widespread commercial application on the Isle of Man? Yes, there are plenty of qualified contractors on the island that could do this.

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Do the style and overall design fit in the current surroundings? n/a as once the carpet/laminate is refitted you won't see the upgrades.

Ease of installation and impact of installation on the householder? The same impact as having a new carpet put in except it could just take an extra half a day per room. We are having our downstairs rooms done as and when we replace our carpets to minimise the impact on our lives.

Is it cost effective? Yes. It is cost effective by reducing heating bills and lasts over 50 years. Also, the hot water pipes will no longer be running through a cold air space under the floor, they will be encased in insulation. This will prevent heat loss from the hot water as it travels around your house. This means that you will end up with hotter water reaching your bath/shower and radiators as a result.

Cost of installation For materials and fitting it can cost £500-600 per room depending on size.

Lifespan of product More than fifty years.

Innovation This is not new technology but they are simple upgrades to make when a homeowner is already replacing a carpet/laminate flooring.

Any potential 'blockages' in taking these concepts to market and how they could be resolved. Homeowners may think it would be an inconvenience but we found that as we had to empty the room already for the carpet it was no extra effort to have the insulation and floorboards done too.

It also gives the homeowner the opportunity to find out the condition of their property under the floor. In just one room we found a joist that was almost sawn through as well as a puddle of water. It also allowed us to mark the positions of the under floor services on to the top of the new floorboards for future reference.

We used the old floorboards as fire wood so they were recycled into heat for our home.

9. Increase the thickness of the underlay. A good quality, insulating underlay will act as a high-quality thermal barrier especially when used over draughty floorboards.

Reason for upgrade. A thicker underlay reduces the amount of heat lost through a suspended floor.

Will the house use less energy? Yes. The home owner would use less oil/gas as the home would retain the heat more.

Will the upgrade cut carbon emissions? Yes.

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Will the upgrade save energy costs? Yes.

Is there potential for widespread commercial application on the Isle of Man? Yes, there are plenty of qualified carpet fitters on the island that could do this.

Do the style and overall design fit in the current surroundings? n/a as once the carpet/laminate is refitted you won't see the underlay.

Ease of installation and impact of installation on the householder? The same impact as having a new carpet put in. We are having our downstairs rooms done as and when we replace our carpets to minimise the impact on our lives.

Is it cost effective? Yes. It is cost effective by reducing heating bills and can last up to and beyond 25 years. The old underlay we took up had been down for a lot longer than 25 years and I'm sure modern products would outlive that quite easily.

Cost of installation The same as for regular underlay.

Lifespan of product Over 25 years.

Innovation This is not new technology but it's not something that people often think of doing. To most people underlay is just something you put under your carpet, they don't realise that it can help to insulate your house and save you money.

Any potential 'blockages' in taking these concepts to market and how they could be resolved. Homeowners may think it would be an inconvenience but as you have to empty the room already for the carpet/laminate to be fitted it is no extra effort to have new underlay fitted too.

The slightly higher cost of thicker underlay might put some people off but, as well as keeping your rooms warmer, it feels softer under your feet. Also, if you think about the extra cost then divide it by the number of years you plan to have the underlay in your house it isn't a great cost after all per year.

Other

10. Install a 'smart' heating system such as Honeywell EvoHome. This will allow homeowners, and also renting tenants, to manage their heating system more efficiently. It can be controlled in person, on your phone, from work or via voice assistants. The system also turns off radiators once a room has reached the desired temperature.

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Reason for upgrade. Residents would be able to heat just the rooms they want, at the time they want and at the temperature they want. They can use it with radiators, under floor heating and stored or shared hot water.

Will the house use less energy? Yes there will be savings from day one. The home owner would use less oil/gas as the home would retain the heat more.

*Upgrading your basic timer and thermostat control to evohome smart zoning could deliver as much as 40% savings on heating your home.
(UK Department of Energy and Climate Control 2014)*

Will the upgrade cut carbon emissions? Yes.

Will the upgrade save energy costs? Yes.

Is there potential for widespread commercial application on the Isle of Man? Yes. There are currently suppliers of the system on Island as well as trained staff to install it. We have an early edition and actually installed it ourselves as it was so simple.

Do the style and overall design fit in the current surroundings? The only visual change is internal through the installation of replacement radiator thermostats.

Ease of installation and impact of installation on the householder? It is not inconvenient at all, we just had to install the thermostats, program the system and then use it. If you use a system that controls water temperature as well then it will require extra time and expense to install it as you will require a professional tradesperson.

Is it cost effective? Yes

Cost of installation For £450 you can get a basic kit including 4 radiator thermostats.

Lifespan of product We expect ours to last us for many years to come. Honeywell is a highly reputable company that makes good quality products. It's such a good product that all the maintenance it needs is a replacement battery in the thermostats now and again.

Cost effectiveness? It is relatively low cost to buy and install and could potentially reduce heating costs by 40% (DECC 2014).

Innovation This is constantly evolving technology which, once mastered, you wouldn't want to be without. I really didn't want one in our house, but my husband was very keen, and now I am a total convert, it makes heating our home efficiently so simple.

Our system actually seems quite primitive compared to those on sale now which are voice assistant compliant and can also monitor your hot water temperature to ensure you don't waste energy heating it too much when it's not going to be used. That said, ours is still very efficient and saves us money year on year.

Any potential 'blockages' in taking these concepts to market and how they could be resolved. The initial cost may cause some people to not want to commit to this type of upgrade. However, with the right government subsidy attached and publication of the

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annual savings that could be made, many more people would hopefully want to install this system.

11. Install new and more efficient radiators and, where necessary, a more efficient boiler.

A lot of 1970's homes still have the original single panel radiators in them because they were built to last. However, the newest double panel double convector radiators, or even triple convectors, are much more efficient in terms of size required and the length of time the heating must be on in order to heat a room. Modern radiators push out a lot more heat than the older ones as they heat up quicker. The fins on modern ones also give off a lot more heat for the same volume of hot water due to them having a greater surface area in contact with the air.

Reason for upgrade. Upgraded radiators will allow residents to heat their homes quicker therefore reducing the amount of time they have their heating on for. A modern and more efficient boiler will use less fuel which will save the owner money.

Will the house use less energy? Yes. The home owner would use less oil/gas as the heating system would be on for less time in order to achieve the same room temperature.

Modern radiators are more energy efficient and they tend to heat up more quickly due to the lower water content which is typically around 24% less than that in radiators manufactured prior to 2000. Also radiators manufactured prior to 2000 can be up to 50% less efficient than modern rads due to the increased surface area of newer radiators.

(Aquatech Service Limited 2019)

According to Manx Gas, if your boiler is more than 15 years old it could be up to 35% less efficient than a new A rated condensing boiler. They are set up to help the public replace and upgrade to highly efficient condensing boilers.

Will the upgrade cut carbon emissions? Yes.

Will the upgrade save energy costs? Yes.

Is there potential for widespread commercial application on the Isle of Man? Yes. Manx Gas are set up to upgrade boilers, and so are a number of private contractors and heating engineers. There are also many qualified plumbers to carry out the radiator upgrades. We also have a scrap merchant on the island who will collect and recycle old radiators.

Do the style and overall design fit in the current surroundings? n/a

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Ease of installation and impact of installation on the householder? It is as easy as you want to make it. If you clear a space around all of your existing radiators and boiler then it will be easy. The homeowner will also have to ensure that all water-using appliances are switched off during installation. If the homeowner has a day job then it could be done whilst they are at work so it would hardly be any inconvenience at all.

Is it cost effective? Yes.

Cost of installation For radiators you can get a basic double fin radiator from B&Q for £58 and for an extra £50 you can get it fitted by a local plumber.

The cost of a new boiler would depend on the make and model and who you got to fit it. Our combi boiler was about £2,000, which was quite expensive, as we needed it fitted within 24 hours (it broke down 6 hours after we moved in at the end of October). Having more time to schedule a fitting and to compare prices we could have saved £500 off that price. Even at this higher price it's only £133/year. If you get one for £1,500 it works out at only £100/year (less than 30p a day).

Lifespan of product Our previous radiators lasted over 40 years and, although they were inefficient, they were still fully functional when we upgraded. I don't see why new radiators would be any different.

Modern boilers are expected to last 15 years or more if well maintained.

Innovation Radiators and boilers are constantly evolving to become more efficient in order to use less fuel and to give the homeowner more heat for their money. Boilers are also becoming more environmentally friendly as time goes by.

Any potential 'blockages' in taking these concepts to market and how they could be resolved. The initial cost may cause some people to not want to commit to this type of upgrade. However, with the right government subsidy attached and publication of the annual savings that could be made, many more people would hopefully want to do this. Once a homeowner/tenant experiences life with a new more efficient boiler and modern radiators they will be very glad that they made the change.

Also, there are finance schemes to assist in buying a new boiler as well as the option to upgrade one radiator at a time so that you spread the cost.

12. Convert an open fireplace to a modern and efficient wood burning stove. For a large number of the 1970's houses the chimney runs up through the centre of the home. This allows for maximum release of heat throughout the house.

DEFA offices and some Local Government social housing projects are heated by wood based products. That type of efficient, ecologically sound and sustainable energy is now available to the public too.

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Reason for upgrade. An open fire-place, even if it's 'blocked up' is the equivalent of leaving a window open in your house all year round, it's just total energy inefficiency. Having a wood burner is like having a large radiator in your home that not only heats your living room, but it heats your hallway (because it backs onto it) and as a result the rest of your house due to air flow around your home. The chimney breast goes through one of the upstairs room too so that gets nice and warm as well. The chimney breast continues to release heat into your home for a good 12 hours after the fire goes out.

When we have our wood burner on we turn the heating off in the rest of the house as it's just not needed.

Also, it is cheaper to buy fuel to run a wood burner than to buy oil or gas for a boiler in order to produce the equivalent amount of heat.

Will the house use less energy? Yes. The home owner would use less oil/gas as the wood burner would provide heat instead of radiators. The longer you keep the fire on for in a day the more energy and money you save.

Will the upgrade cut carbon emissions? Yes. Wood burners have been getting a bad press recently but the modern low emission ones can have a 'clean burn' which more thoroughly consumes the wood without releasing byproducts.

The new Catalyst wood burner recently won the MIT Clean Energy Prize in the USA.

Using a wood burner will also reduce carbon emissions by requiring less oil and gas to be shipped to the island. The wood that we use is farmed in a plantation by the Manx Government and chopped and delivered to us by a local man. The fuel used to transport it from where the tree fell to our house is minimal. Ask yourself how much fuel it takes to transport oil and gas to the island....

The use of wood in efficient wood burning stoves is also increasingly believed to be carbon neutral. It certainly does not require the mining of fossil fuels in order to use it.

Will the upgrade save energy costs? Yes. A wood burner was the first energy efficiency upgrade that we made and it had an instant effect in reducing our boiler's oil consumption.

Is there potential for widespread commercial application on the Isle of Man? Yes. There are a number of local companies with the ability to install this type of thing. They also have the knowledge that would enable them to advise the public on which size of wood burner to buy, the importance of this decision cannot be underestimated.

Do the style and overall design fit in the current surroundings? n/a

Ease of installation and impact of installation on the householder? It took one and a half days from start to finish. This included removing an old electric fire, opening up the fire area, lining the chimney, fitting the wood burner, fitting the fireplace, tiling around it and fitting a mantel piece. We had our first fire the day the work was completed.

There was a bit of dust but nothing major and the installer cleaned up after himself both days.

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Is it cost effective? Yes.

Cost of installation We paid in total just under £2,000 for everything, which included a fancy mantelpiece, but you can get cheaper ones.

Lifespan of product When maintained correctly, a good quality one can last a lifetime.

Innovation There have been great strides taken in the technology behind wood burner efficiency in recent years leading to some labelling them carbon neutral. The basic product may be an old idea but the technology used to design modern ones is cutting edge.

Our island has the potential to become a nation that predominantly heats its' homes by wood burner. If you want the island to be more eco-friendly then this would be a good way to go about it. The fuel is farmed locally, the distance the logs have to travel from plantation to homes is minimal, it's low emission and possibly carbon neutral, the plantations not only support wildlife and recreational activities but they also support the local economy too by being owned and run by the Government. It would also stop our island being so dependent on the UK for oil and gas as it wouldn't be needed so much. Not many countries can say that they grow most of their own fuel, we could if we chose to go down this route.

Any potential 'blockages' in taking these concepts to market and how they could be resolved. The initial cost may cause some people to not want to commit to this type of upgrade. However, with the right government subsidy attached and publication of the annual savings that could be made, many more people would hopefully want to install this system. Once a homeowner experiences life with a wood burner they will be very glad that they made the change.

Homeowners may be concerned about where they would store their wood and this is a valid point but, if you have a garage (which your car will no longer fit in as modern cars are too big for most garages), then you can store it in there. Nearly all 1970's houses have a garage so storage shouldn't be an issue. However, an outside wood store could be erected if suitable space can't be found in a garage.

An important thing to mention about having a wood burner is that it's a lifestyle, not something you just do now and again or it just isn't worth it. The public need to get into the mindset of previous generations where taking a few minutes every day to set up and light the fire was not such a hardship. Bringing a couple of buckets of wood in every day and taking out the ash once a week aren't such a big deal once you start experiencing and appreciating the wonderful benefits of having a wood burner.

We recycle our household cardboard and newspaper waste into firelighters. We also use sticks from our hedge trimmings as kindling too. Also the ash from the fire can be used as a soil conditioner so it needn't be thrown away.

13. Install insulated wall and ceiling panels in the bathroom. Panels made of a variety of materials including wood composite, acrylic and pvc.

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Reason for upgrade. Bathrooms with tiled walls feel cold and they get covered in a lot of condensation which causes mould and damp problems. This damp often causes mould to appear in a variety of places around bathrooms including the ceiling.

Installing wall and ceiling panels makes a room feel warmer instantly whilst requiring less heating as the wall surfaces don't chill the air like tiles do. Having panels fitted also massively reduces the amount of condensation on the wall/ceiling surfaces. They also are much easier to clean than tiles with no grout to worry about. The walls in our shower cubicle get cleaned with a window cleaning squeegee, bought for £2, and the ceiling doesn't need any attention at all. It will also never need to be repainted as there is no paint and therefore no ceiling mould.

Will the house use less energy? Yes. The home owner would use less oil/gas as you would need to heat the bathroom for less time as the panels help insulate the room and reduce the amount of heat being lost.

Will the upgrade cut carbon emissions? Yes.

Will the upgrade save energy costs? Yes.

Is there potential for widespread commercial application on the Isle of Man? Yes. There are a number of local companies with the ability to install this type of thing.

Do the style and overall design fit in the current surroundings? n/a

Ease of installation and impact of installation on the householder? It took the same amount of time to have ours installed as it would have taken to have the bathroom re-tiled.

Is it cost effective? Yes. It costs the same as having a bathroom tiled so you get the energy saving at no extra cost.

Cost of installation It costs the same as having a bathroom tiled.

Lifespan of product This can be up to 20 years. Most people will have redecorated their bathroom at least once before these panels start to wear out.

Innovation There has been great progress taken in the technology behind this type of panelling in recent years. They are now seen as a very good alternative to tiles and no longer have the unfair reputation of being a bit cheap-looking. The panels on sale today can be very high-end and you are pretty much able to have any design and colour you like.

Any potential 'blockages' in taking these concepts to market and how they could be resolved. There are still quite a lot of people who either don't know about panelling or haven't considered it because they don't know enough about it. Once someone actually sees some that has been installed, and hears the benefits of it, they can quite quickly become a convert. Regardless of the energy efficiencies, given the chance to never paint your bathroom ceiling again or clean mould off grouting who wouldn't give it a go?

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How would these upgrades be to the Isle of Man's overall benefit in environmental, economic and community terms?

Environmentally The homeowner would use less oil or gas which would mean a reduction in the amount required to be shipped to the Island. It would also mean less fossil fuels would be extracted from the planet which can only be a good thing for everybody.

In terms of the upgrades that reduce dampness in homes, these can have a profoundly positive effect on a resident's health. If you have damp and mould in your home you're more likely to have respiratory problems, respiratory infections, allergies or asthma. Damp and mould can also affect the immune system. Those most sensitive to these types of issues are babies and children, elderly people, those with existing skin problems, those with respiratory problems and those with a weakened immune system, such as those having chemotherapy. (NHS 2019)

Economically It would create jobs in a variety of areas and save money for residents in terms of fuel bills. This in turn would create more disposable income for spending within the local economy.

In **community terms** it would improve the quality of life for those living in the houses by making their homes warmer, drier and potentially healthier to live in. In some cases it would improve the visual appearance of residents' homes too. It would also make residents happier knowing that they have cheaper heating bills and more disposable income available.

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Our family's experience

Over the last 5 years we have spent almost £25,000 on upgrading our home in nearly all of the ways mentioned above. The only one we haven't done yet is the reflective foil behind our radiators, but we have the materials and just need to fit it. I can recommend all of these measures and believe that they all make a difference.

As mentioned before, our energy bill has gone down from about £1,600 per year to only £600. That is a massive saving of £1,000 a year and for many it could be a lot more. We have a 4 bedroom detached 1970's house and if we can reduce our heating bills to that amount of money each year imagine how little someone living in a 2 or 3 bedroom home, semi or even a terraced 1970's home could reduce their bills too. The savings could be massive.

Government commitment

Government has made a big deal about committing the island to being 'net zero emissions' and acknowledging a climate emergency. Now is the time to put your money where your mouth is and show us you actually mean what you say. The public will not make that step in investing their hard earned wages in energy saving home improvements without Government supporting them both financially and organisationally.

After all, if Government doesn't show it is serious about it, why should residents. Many will probably take the view point that if the Government's not really bothered then they'd rather spend their hard-earned cash on other things. Plus, we see millions and millions being spent, and sometimes wasted due to poor quality work needing re-doing, on projects like the Prom and other 'upgrades to infrastructure' so it's not unreasonable to expect Government to also help finance upgrades to our own home's infrastructure. Local Government owned social housing across the island is being upgraded to make them warmer, drier and more energy efficient. Please don't make owner-occupiers feel like you only care about those who live in social houses having warm, energy efficient homes. If you can invest in social housing then you should be able to invest in privately owned houses too.

Also, if the Government is serious about helping residents have desirable, warm, affordable homes for life then subsidies for these types of upgrades must be available, and available to everyone, not just for those on a low income.

Government must also make it as easy as possible for homeowners. We all know the hassle of trying to organise for a tradesman to carry out work at our homes. First you need 3 quotes, which you have to take time off work in order to be at home for, then you need to organise a date (which can often change due to the nature of this type of work) and then you need to ensure you're in when they start work each day. After the work is finished you may have 'snags' that need sorting out too which is extra hassle. I don't know anyone who looks forward to having work done on their house by contractors. Imagine how the public will react if you tell them to do the 13 things I've suggested, not very favourably I think.

The Retrofit of the Future

Putting myself in their shoes, I'd dread the hassle and work involved in organising it all. For a start off you'd need 39 separate quotes in order to ensure a decent price for each of the 13 upgrades. Taking time off work 39 times just for quotes is ridiculous and an unreasonable thing to expect people to do.

You need to make it incredibly easy for homeowners or it just won't happen.

How to get it done

My suggestion would be this:

- A central place to register for a home assessment.
- A home visit by an assessor who would check your home to see which of the upgrades would be appropriate.
- You receive a basic form outlining which types of upgrade are appropriate for your home and how much they'd cost (including how much a person could receive in Government subsidies) and how long they'd each take to carry out. The form would need to be itemised to allow the public to do the work bit by bit, if they so choose, as most people won't be able to afford to do it all at once, we certainly couldn't.
- You would tick next to each of the upgrades you wish to have then sign and return the form. The homeowner then joins the official waiting list for upgrades.
- When they near the top of the list the Government will contact them with a date for the work and ask them to confirm that they still want it done.
- On the agreed date the Government's contractor turns up and carries out the work.
- Upon completion the Government will send out an assessor to confirm that the work has been done correctly.
- The homeowner receives a letter confirming that the work has been completed to a satisfactory standard and that payment is now due.
- The homeowner pays for the work.

In order for this to work the Government would need to set up a whole team solely with the purpose of organising these upgrades. A vetted group of companies would also need to be contracted to work solely on these upgrades. Government staff would then manage the paperwork side of things including the scheduling of when the upgrades will be done.

This would allow for those who applied first to be done first, however, it would also allow staff to ensure that houses near each other were done at similar times in order to maximise the use of the workforce. Flexibility must be factored in. It would also allow for economy of scale as all supplies could be centrally organised, stored and paid for by the Government.

The Retrofit of the Future

Other things to consider

Upgrading during a house move.

Some homeowners might find things like internal wall insulation, under floor insulation, replacing radiators or fitting bathroom panels too disruptive. This can be got around by having them done when someone is moving into a new property. You may not be able to do every room but it's surprising what a committed team of professionals can do in a day when they try. It may also be possible to have a special subsidy for those who wish to take this route. The subsidy package could include funding to cover the cost of an extra couple of days storage, by the removal company, along with the equivalent number of nights in a hotel. In just 3 days, radiators could be replaced with foil reflectors fitted behind them, floors could be lifted and replaced with insulation fitted underneath, new underlay and carpets could be fitted, window units could be replaced and a wood burner installed. It's all possible with the right amount of commitment from both the homeowner and Government.

Creating upgrade packages

All of the work that I have outlined can be done in stages so that there isn't a wall of expense for the homeowner to face. Everyone would benefit from just one or two of the upgrades even if they couldn't afford all of them.

To help the homeowner, the Government could have 'packages' of work which could be done in conjunction with each other.

- **Floor package:** A floor upgrade to be done when you have a carpet replaced. You can lift the floor, fit new insulation underneath, put in a new floor, fit new underlay then fit your new carpet on top.
- **Wall package:** A wall upgrade when you need the pebble-dash replacing. Having external insulation fitted and the house re-pebble-dashed. If you wish you could have the window and door units upgraded too.
- **Roof package:** A roof upgrade to be done when you need your roof replacing. When you have the roof tiles replaced you can have the batons replaced, the membrane replaced, extra insulation put in, foil insulation on the inside of the panels of insulation in your roof and loft/eaves doors insulated and checked for draughts.

This type of 'package deal' would be particularly useful as people nearly always need to be able to live in their homes whilst they are being upgraded. If Government can't arrange this then any scheme just won't work.

If you combine the ability to stay at home during the upgrades with the previously mentioned Government team organising the work then the plan stands a good chance of working. However, the public will need to have the quantifiable gains for both themselves and the environment demonstrated in order to get them to buy into it.

With economies of scale you can also sell the idea as them getting a bargain. Everyone loves a bargain, particularly if it helps them save money in the long run and equally now, particularly amongst the younger generations, if it helps save the planet.

The Retrofit of the Future

Providing financial support

There must be subsidies for this work if you want the public to buy into it. As well as providing subsidies the Government should create a 0% interest loan scheme. This loan would be attached to the property, not the homeowner, and would then pass onto the next homeowner when the property was sold. The price any property is sold for could take into account any loans held against the house.

Without this sort of thing you will not get people investing in their homes if they are planning on moving house at any time. After all, why would you invest thousands of pounds on installing insulation if you were just going to move out in a couple of years and not reap the benefits of your financial investment in your property?

Let people see and feel the products before they commit to them

Companies that build housing estates always have a 'show house'. They don't have this to show off what they've done, they have it as a hook for potential buyers. Reading about something doesn't have the same effect on a person as actually seeing and touching it.

Make yourself a show house that has all of the upgrades on offer. Only by experiencing some of these upgrades will people really understand how great they can be and what they actual entail.

Things that don't work

I would just like to mention two types of upgrade that are not suitable for this style of house:

- Solar panels are not advisable. Our neighbours have them and they had to install almost 20 in order to make it function to an acceptable standard.
- An air-source heat pump will not work properly in this type of property due to the design of the floors and the difficulty in locating it in an appropriate place.

The Retrofit of the Future

In conclusion

As someone that lives in one of these houses, that has had all of these upgrades done, I know how wonderful they are and how much cheaper our heating bills are and how much more pleasant our home is to live in now.

If Government can get this right then it will be revolutionary for our island.

- We will all live more environmentally sound lives.
- We will all live more economically sustainable lives in terms of fuel costs.
- We will become an example to the UK and the rest of the world.
- We will no longer have pensioners sitting in cold houses because they can't afford to turn their heating on.
- We will reduce the number of hospital admissions for illnesses caused by, or exacerbated by, damp and mouldy houses.

And finally and most importantly, we will raise the next generation of children in a culture where doing this type of thing is 'normal'. They will see that making an effort, having homeowners and the Government investing together, installing energy saving devices and products is just what we do.

It will no longer be about whether we can be bothered, whether we can afford to do it or whether we want the hassle of doing these things. Those not doing them will be the odd ones out instead of how we are now, where those of us doing them are considered that way.

Be brave, make the commitment and hopefully our island's homeowners will too.
