RIPEET Final Report

Work Packages 5 and 6 – Energy Efficiency and Renewable Energy Options in Households in the Outer Hebrides

Remote rural households: Isle of Harris

December 2023

NORTH, WEST AND HEBRIDES
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Source: https://www.iwa.wales/wp-content/media/nazrin-b-va-iKjAj_oq-IE-unsplash-e1610541326497-

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ABSTRACT

Households research – RIPEET Work Packages 5 and 6

The decarbonisation of Scottish homes is necessary to meet targets for mitigating climate change. In the UK 25% of GHG emissions originate from households (Lancaster University n/d). However, Scottish islands such as the Outer Hebrides face unique challenges, with an energy mix vastly different to the national average, high rates of fuel poverty, transportation and supply chain issues, and a diversity of local and regional circumstances which negates any one-size-fits-all policy. This RIPEET pilot project explores the challenges and opportunities for rural homes in the Outer Hebrides to be more energy efficient, enabling the residents to have warm, efficient, and comfortable homes and in turn reduce household energy poverty in the region. A parallel priority explores household options for the utilisation and production of renewable energy in Outer Hebrides homes and communities via a mixed-methods, grounded theory approach. This research approach was guided by the co-creation process involving multi-stakeholders from the local area, to develop a community of practice used to provide the scaffolding around which the research projects could construct their knowledge and findings.

Through in-depth interviews and surveys with a range of stakeholders and communities, pros and cons are highlighted for the current emphasis on standard technology and energy efficiency options, and for the future pathways for innovative and alternative technologies. Barriers to uptake are identified, and differences between circumstances at all scales are discussed. Through thematic analysis, several interlinked themes were explored across the two studies linked to: renewable technology factors; economic factors at the household level in the islands; supply chain issues for materials and services in the islands; sustainability and the role of communities; the availability of installers; a one size fits all policy approach on retrofitting; the need for clear and easy to access information and guidance on options available for households; and understanding and accessing funding grants and loans. So, the main barriers were found to be economic, but the solutions are not merely financial. A range of issues confront individual households and communities, from installer availability and aftercare to housing fabric, which, if ignored risks exacerbating inequalities. The future of renewable technology and energy efficiency measures rollout, housing stock improvements, and policy to guide them, is a complex issue. Options exist for community collaboration and innovation to meet these challenges, and islands in the Outer Hebrides need to be empowered to define their own decarbonisation pathways to support the transition to net zero homes.

Introduction

Background

1.1 The decarbonisation of Scottish homes is necessary to meet targets for mitigating climate change. However, Scottish islands like the Outer Hebrides face unique challenges, with an energy mix vastly different to the national average, high rates of fuel poverty, transportation and supply chain issues, and a diversity of local and regional circumstances which negates any one-size-fits-all policy.This research investigated household options for the utilisation and production of renewable energy in the Outer Hebrides and opportunities for energy efficiency, in rural homes. This research project included interviews and surveys with various stakeholders including residents, local authorities, government funded organisations, social housing providers and builders.

RIPEET Pilot

1.2 The RIPEET pilot project is being co-created in the Outer Hebrides in consortium between the University of the Highlands and Islands North, West and Hebrides (UHINWH) and Comhairle nan Eilean Siar (CnES) to address the key regional energy need as identified by regional RIPEET stakeholders to: ***Explore solutions to reduce household energy costs by better utilising locally generated energy.*** RIPEET regional partners Highlands and Islands Enterprise (HIE) and Community Energy Scotland (CES) are overseeing the delivery of the RIPEET pilot.

1.3 Tasks and milestones for the RIPEET pilot were collaboratively set between the RIPEET Scottish regional team and representatives from UHINWH and CnES. The purpose of this document is to provide a final report on the progress against these milestones, Work Package 5 – Household Rewnables and Work Package 6 – Household Energy Efficiency, as of November 2023.

1.4 The Outer Hebrides Local Energy Economy is a pilot project framed under a call for innovative energy solutions, under the RIPEET project. The solution aims to:

i. Identify and overcome barriers to developing a local energy economy; specifically selling locally generated energy directly to local consumers through existing grid infrastructure via a locally owned energy supply company (ESCo) or alternative solutions.
ii. Explore optimum mix of domestic renewable energy generation technologies
iii. Explore innovative interventions for energy efficiency improvements particularly in hard-to retrofit, island properties

1.5 In the interest of gaining solutions to three main challenges:

1. Fuel poverty
2. Increasing energy prices
3. The mechanism whereby island generated renewable energy is sold to the National grid through export to the mainland UK, with perceivably little benefit to the wider community.

This report aims to summarise key findings from the pilot regarding points **ii** and **iii** above.

Household Research

1.6 In the UK 25% of GHG emissions originate from households (Lancaster University n/d). As a result there is a drive by the UK government to improve the energy efficiency within buildings, with a focus on homes, supporting both private and social housing. Hinson and Bolton (2021:7) state that "…*energy efficiency is key to decarbonisation as it reduces energy consumption and in doing so can also reduce fuel poverty and improve energy security*."

1.7 Plans to decarbonise households will also be reliant on the increasing adoption of renewable energy technologies (Scottish Government 2023a). Therefore, exploring the different renewable technologies is essential (Hesselink & Chappin 2019; Sridhar & Salkuti 2022), as is understanding the barriers to their adoption in comparison to more traditional options such as heating oil (Scottish Government 2021: 81; Kerr & Winskel 2020: 7).

Research Methods

Background

2.1 **The RIPEET project in the Outer Hebrides of Scotland engaged two final year students attending the University of the Highlands and Islands to undertake the research work for Work Packages 5 and 6**. Both students were studying on UHI's postgraduate Masters degree (MSc) in Sustainable Rural Development. Both students had current and continuing work experience in their field of research in addition to their course-specific studies. They were commissioned for a 9-month limited research project in the field of household energy efficiency and renewable energy respectively.

2.2 Through interviews and surveys with a range of stakeholders and communities, the pros and cons were explored for the existing standard technology options/upgrades for energy efficiency and renewable energy being promoted to households in the region. Pereceptions on future and emerging opportuninties for innovation and alternative approaches to enhance energy efficiency measures and adopt renwable energy at the household level were explored.

2.3 The first phase of both research projects involved a full literature review on their respective fields of study to discover the 'state of play' in their chosen field of research. This is a useful practice as in addition to knowledge on the subject, it also reveals the qualitative and quantitative methods used by other researchers in the field to capture data and so provide ideas and hints for replication and the use of '*what works*' in the sector.

2.4 In both instances this literature review was used to identify a current gap in knowledge-base which could then be researched to provide new insights.

2.5 In terms of sampling, both research projects were co-designed to attain the requirements of an MSc award. To this end they sought to attain feedback from a representative sample of between 50-100 households to attain a good spread of feedback from multiple tenure sources (e.g. privately owned, social rented…etc) and varying housing stock sources in the region selected.

2.6 The survey into household energy efficiency (WP5) was distributed to 118 community groups across the Highlands and Islands and 30 groups agreed to share the survey with their local residents. A total of 87 households replied to the survey and for the purposes of the RIPEET pilot project, these households located in the Outer Hebrides were identifed and the results examined. In the Outer Hebrides a total of 27 (n=27) households replied to surveys issued on energy efficiency. The survey was live for 14 days. A further 47 organisation representatives were identified from the stakeholders group from housing associations, local authorities, advistory bodies and organisations and builders and industry consultants. From this group 25 agreed to be interviewed to provide an additional source of data to enable a more robust mixed methods approach to be pursused.

2.7 Similarly the survey into household renewables (WP6) also targeted community groups on the islands and west coast of Scotland. A total of 117 households replied to the survey and for the purposes of the RIPEET pilot project, these households located in the Outer Hebrides were identifed and the results examined. In the Outer Hebrides a total of 40 (n=40) households replied to surveys issued on household renewable energy. The survey was live for 14 days. A total of 220 stakeholder group representatives were approached for their views and a total of 45 responses were received. In the Outer Hebrides, a total of 13 (n=13) stakeholders replied to offer their perspectives. These stakeholders were identified as being community organisations, home energy organisations, home energy installers, housing associations and local authority representatives. These results provide therefore just a snapshot of perspectives in the islands.

2.8 Both resident surveys were targeted at various online social media groups related to island communities, to allow ease and speed of access to the necessary sampling frame (Schneider & Harknett 2022: 134; Whittaker, Stevelink & Fear 2017: 9). A targeted search was performed on Facebook for community groups relating to island communities. These were filtered by relevance and admin rules to identify groups which would potentially be suitable for survey circulation. Most groups employed admin approval for outside or anonymised posts, and admins were also messaged for gatekeeper approval.

2.9 For the purposes of meeting the criteria of their MSc research and to generate a statistically robust of depth of data, both students commissioned for this work, surveyed wider, across the Highlands and Islands, although these findings were out with the scope of this study.

For the RIPEET project it was useful to have the wider Highlands and Islands data with which to compare themes from the Outer Hebrides. This allowed differences and similarities to be drawn out. Having compared Highlands and Islands results with Outer Hebrides data, there is much simlarity between the two data sets, with minor differences being highlighted in a series of leaflets which will be circulated throughout the Outer Hebrides to key stakeholders.

2.10 In both instances a mixed-methods research approach was followed using JISC online surveys to gather a mix of predominantly quantitative data and some qualitative data. Further qualititative data was sourced from a series of in-depth structured and semi-structured interviews of 45-1hour duration.

2.11 Co-Creation – To facilitate and steer the research focus, a local stakeholders group was utilised to fine-tune the research focus and help set and review milestones. As this group met futher to review milestones, a community of

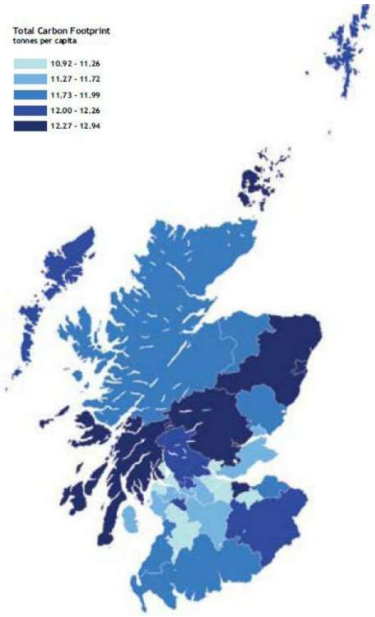
practice evolved as an ethos of knowledge sharing became normalised across a range of partners who had often worked in parallel in the past rather than together. The benefits of this process will be lasting as new relationships have been formed and the advantages of co-creation in a community of practice recognised for the added value it can bring to final outcomes. Appendix 1 reviews and assesses this process.

2.12 Ethics - All participants were given participant information and a privacy notice prior to the start of the survey or interview. All survey responses were anonymous. Interviewees were asked to sign consent forms, and permission to audio record. This was then transcribed and the audio deleted. To ensure anonymity, specific reference to respondents' experience and location are kept to a minimum in this report. All data not published in this report will be deleted within 6 months of completion.

Source: https://pixabay.com/photos/survey-interview-questionnaire-6236634/ [Tumisu]

Findings (Key Learnings)

3.1 The per capita Carbon Footprint of the residents of the Outer Hebrides provides a significant challenge in the Scottish context. It is in the second highest band of per capita regional emitters in Scotland and at the same time has some of the largest deficits in household emissions due to the poor average level of its housing stock in comparison with the environmental conditions linked to the marine climate with wet and windy conditions year-round presenting a particular challenge.



Source: Scottish Parliament Information Centre Research Briefing (2021)

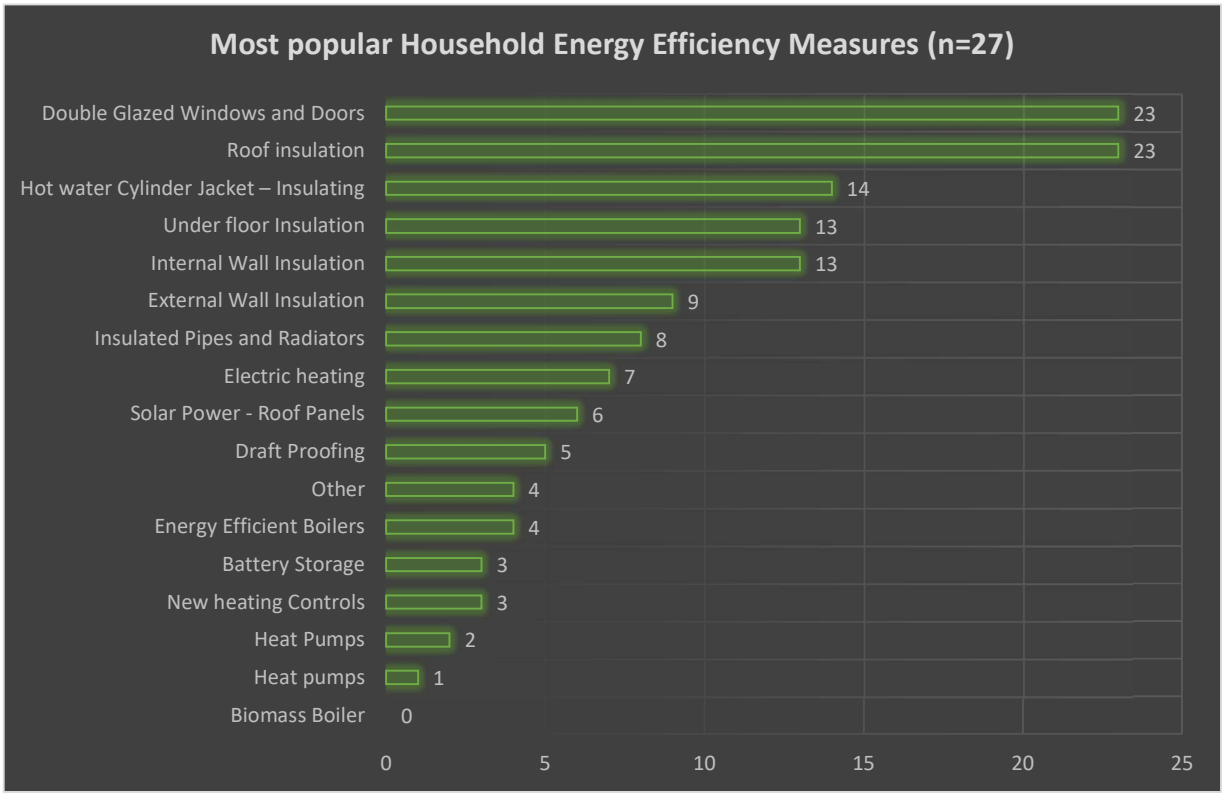
3.2 Average salaries at £17,428 (compared to £26,624 in Shetland) in the Outer Hebrides (Adzuna 2023) are the lowest in the UK and average household incomes are £21,600 p.a. (NHS n/d). In this context we can see the challenge and so potential impact that can be achieved at the household level with energy efficiency and renewables upgrades at the household level. The challenge is about prioritising and encouraging investment in a region where household income is so low. Yet such upgrades if achieved, will reduce annual energy bills and this will have a disproportionate potential impact on wealth and arguably, health.

3.3 In terms of baselines, a recent report by Energy Action Scotland (2022) has found that household energy bills in the islands have increased by 240% since 2021. In the Outer Hebrides official figures (UK Govt 2022) estimate a fuel poverty level in the islands of 53.5% of households. A more recent study locally by a local housing sector organisation estimates a figure closer to 80% (Tighean Innse Gall 2023) – i.e. the number of households spending 10% or more of their annual income on household energy bills.

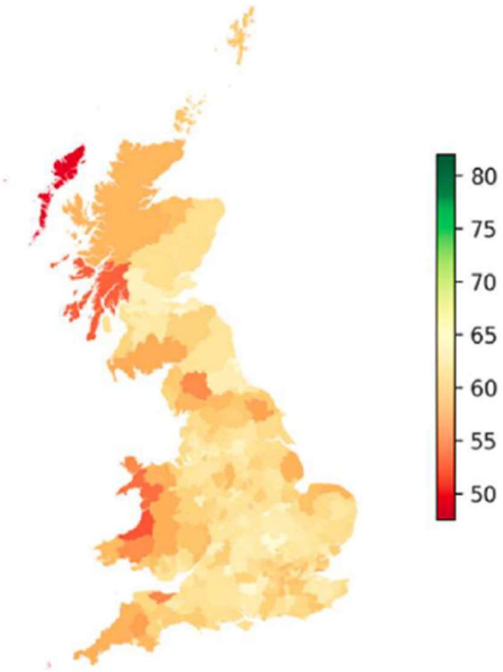
3.4 In this cross-section of Outer Hebrides households surveyed, 85% of respondents had both double-glazing and loft insulation and this is a testament to upgrade schemes over the last several decades which have grant-supported these household-level upgrades. So, going forwards where will targeted support have most impact in terms of value for money and emissions reduction? The following chart sumarises our sample baseline detail data with regards to energy efficiency.

3.5 **Most Popular Energy Efficiency Measures in Outer Hebrides**

Apart from insulation on their hotwater cylinder, less that 50% of households in the sample indicated their household possessed many of the other most common energy efficiency upgrades common across much of the new-build housing sector in particular. These findings track with national figures which display a very poor level of energy efficiency score in the local authority area of the Outer Hebrides:



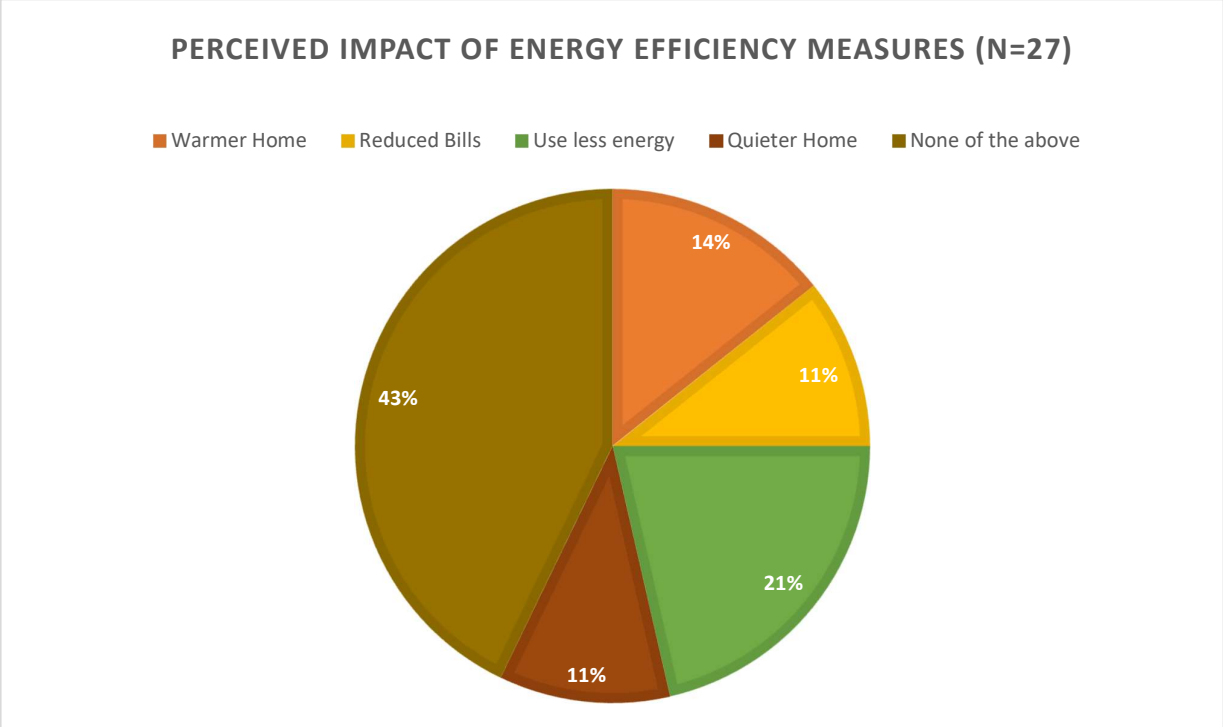
3.6 Average Energy Efficiency Score of Local Authorities



Source: Ahlrichs et al. (2022)

This data identifies that there is a particular issue in the Outer Hebrides when comparing the region to the rest of the UK. The baseline or starting position to transition the housing stock and residents in the islands is lower than in any other area of the UK. This leads one to question the 'one-size-fits-all' policies that, to date, have resulted in this deficit.

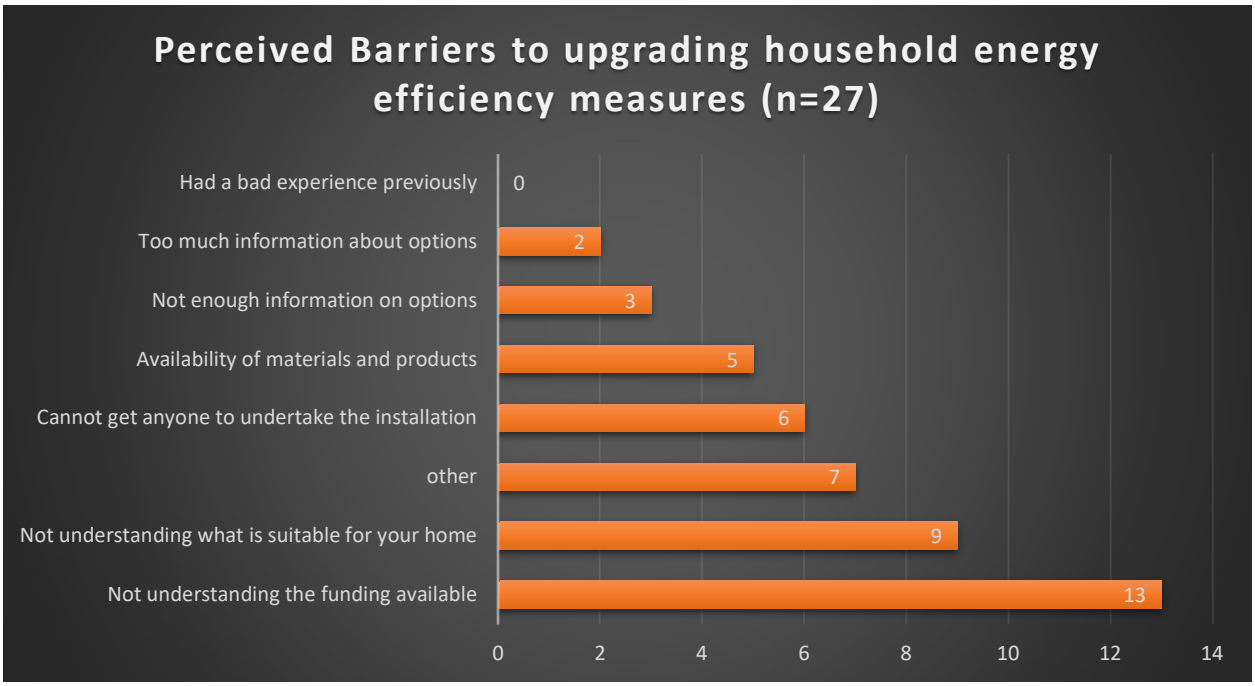
3.7 Perceived impacts of Household Energy Efficiency Measures in Islands



A total of 46% of respondents identified a 'warmer home / reduced bills / using less energy' as the primary impacts of installing energy efficiency measures. In the context of a 'cost of living' crisis, at least in part derived from massive increases in home energy costs, this is a promising response.

3.8 On the flipside, 43% of households did not notice a difference from installing energy efficiency measures, but then in the context of rising fuel costs this is maybe not a surprise.Householders have incurred higher unit and standing charge costs for energy. It may be that energy efficiency measures have provided some level of hidden buffer for many households, as prices have risen for household energy supply across the board.

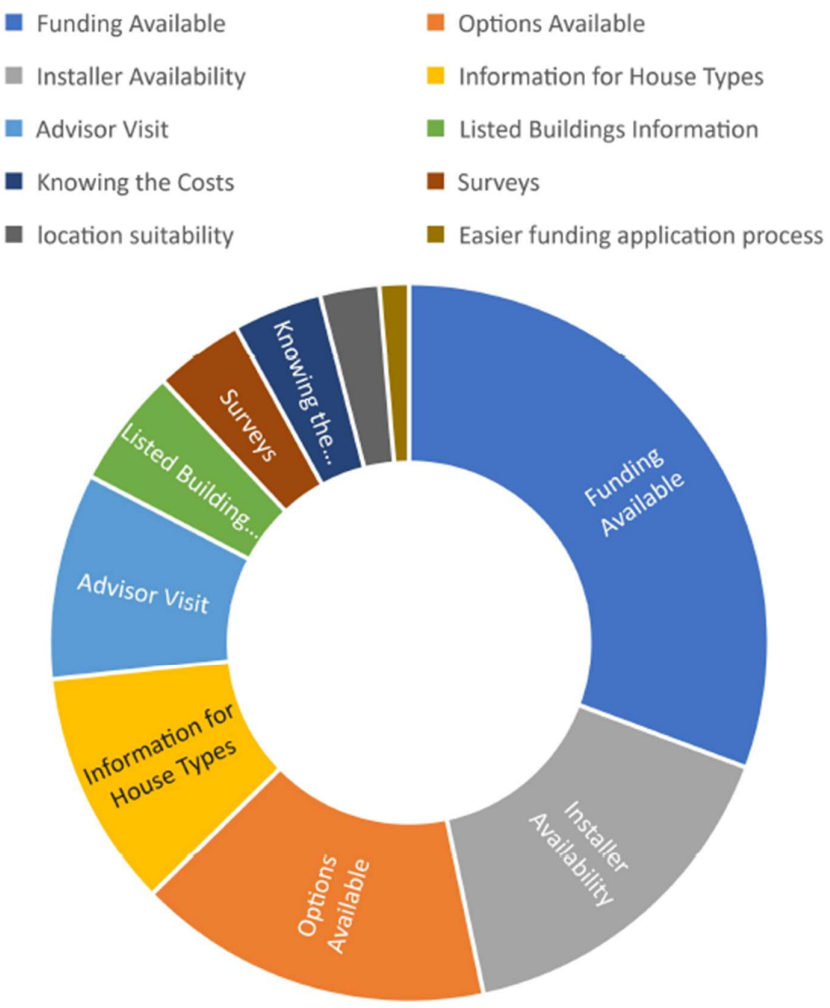
3.9 **Perceived Barriers to investing in Energy Efficiency Measures for the home**



Confusion would seem to be the main issue around funding and funding sources to help upgrades. Social media is full of adverts for free upgrades, but many do not apply in the islands. There is also no one-stop-shop for funding advice and it appears there is little clarity on sources and schemes. There is also uncertainty about the most appropriate technologies for households – is my South-East facing roof appropriate for Solar PV?

Is solar thermal realistic in the Outer Hebrides?....Should I invest in monocrystalline or polycrystalline panels and which perform best with direct sunlight (e.g. in cloudy conditions). Can I get competitive quotations from installers and are there any qualified installers in my area? Are there supply chain issues for any chosen products? particularly if something goes wrong. What happens after the quoted 10-15 year operating lifetime - is replacement affordable?

3.10 Key factors that help residents choose to invest in energy efficiency



When residents were asked what would make the largest difference, residents stated it was information on the funding what was available for their household and how easy the funding application was. Other factors

related to installer availability, information on options and information on their household suitability.

3.11 Measures that would make the most impact

Data was collected from survey participants on the most important factors needed to improve the retrofit of energy efficiency measures. They were asked to select key actions to improve the current situation. These were then ranked from 1-7, the primary focus was on tailor made package of options to support individual house types and ages but also included, upskilling and training, local materials and better information.

Rank Value	Priority Support for Energy Efficiency Measures
1	A package of options to support individual house types and ages.
2	The upskilling and training of trades people
3	Locally based certified installers
4	The increased use of locally sourced materials
5	Locally available and stored materials
6	Availability of accreditation schemes for installers
7	Better information on energy efficiency options

3.12 Household comments on Energy Efficiency in Outer Hebrides (Extracts)

- "We had solar panels put in ourselves. There were a lot of competing firms & their salesmen all had a different idea that they were aggressively marketing. We had to buy books & study, so we knew whom to trust."
- "More information adapted for rural and older properties."
- "Someone willing to install underfloor insulation on the island."
- "More efficient and easier funding application process - I've recently had PV solar panels fitted and grant application process through Home Energy Scotland was a nightmare!"
- "I cannot afford to get energy efficiencies done to my home, the double-glazed window are old and no longer efficient, they need replacing & I just cannot afford to replace them."
- "Someone to visit, state what can be done, identify costs and any funding available."
- "Better understanding of how suitable the measures are for homes in the Outer Hebrides, e.g. some ASHP should not be installed within 2 miles of the sea, due to corrosion.
- "Installers are hard to find...impossible to find a hybrid wind/solar installer to even reply to an email."

Some qualitative comments were also gathered to add some added value to the quantitative survey-based findings. Sometimes such parallel research can identify new issues or add to the robustness of quantitative findings. So although in quantitative terms at n=27 the survey sample is small, the

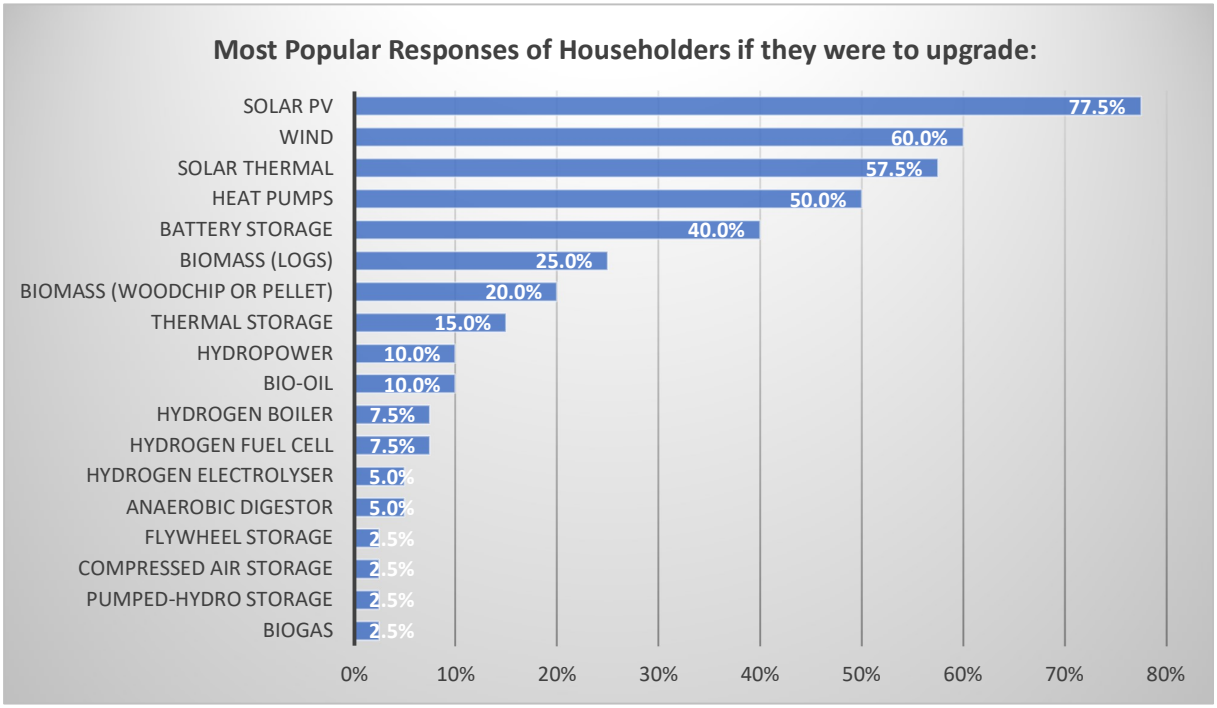
addition of the qualitative input helps to add reliability to the findings of this sample.

WP5- Domestic Renewable Energy – State of play perceptions & insights

3.13 Most Popular Renewable Upgrades in-demand by Householders

Respondents to this survey (n=40) overwhelmingly chose Solar PV (77.5% chose this option) as being their preferred choice of renewables upgrade at the household level.

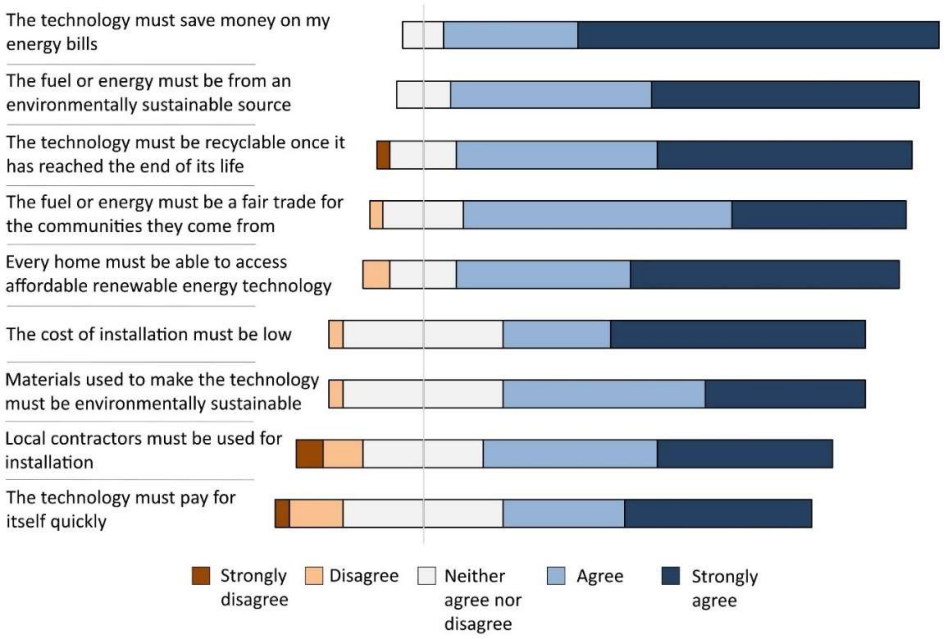
Two further technologies Wind and Solar Thermal were also identified as priorities by over 50% of respondents (Wind – 60% and Solar Thermal – 57%). These two technologies placed as second and third most popular upgrades householders would wish to proceed with are very interesting, as uptake and rollout of household micro-wind and solar thermal technologies are currently at a very low level in the islands, yet demand appears high. This would seem to be a result that needs some further work and investigation. These results are presented below:



3.14 At the regional RIPEET wrap-up presentation and discussion, in terms of outcomes it was suggested that we develop a local web portal that provides

information and advice on these technologies as a starting point for householders seeking islands/regional specific data and information on household renewables options specific to our envrionment and geography.

3.15 **Factors influencing investment decisions in household energy upgrades.**



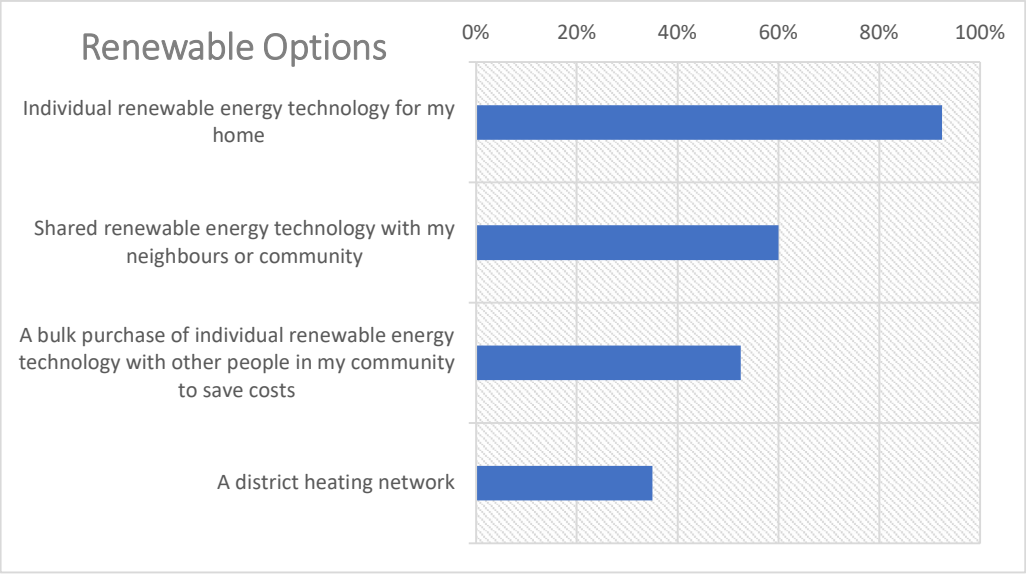
With regards to the main factors currently influencing investment decisions in home energy upgrades (n=40), the primary factor was perhaps not a surprise and relates to the new technology's ability to save on household bills. What was also encouraging is that householders were also primarily committed to transitioning to sustainable energy solutions. What was of note and what came through strongly were questions around 'end of life' for various technologies.

3.16 An example provided was by a householder who can access grant assistance to convert to a heat pump with an anticipated 15-year working life. However, if as is currently the situation and no grants are available for replacement at 'end of life', then householders adopting this technology must save-up £1k per annum to cover the replacement costs and so this added cost must be factored-in to any investment decision. In a region with such high levels of fuel poverty already, are these extra costs realistic for householders to accommodate?

3.17 At a recent Community Council meeting in the islands where these provisional results were discussed, several householders identified that although the grant funding for a heat pump covers much of that cost, it goes nowhere near the full costs of retro-fit and the costs of linked boiler and heater replacement, insulation and associated pipe work, where two differing 'real' costs were quoted as being £22k and £25k. The feedback was that a % based grant (e.g. 75%) towards the full costs of a retrofit heat-pump installation would be more transparent and useful for householders. In this context it was stated that much of the promotions for such upgrades on social media are misleading and leading to a lack of trust.

3.18 Also coming through strongly in the survey feedback was this point that the installation costs must be low and so every home should be able to access an affordable means to upgrade to renewable energy for which there is a strong expressed demand. The level of this demand is captured below:

3.19

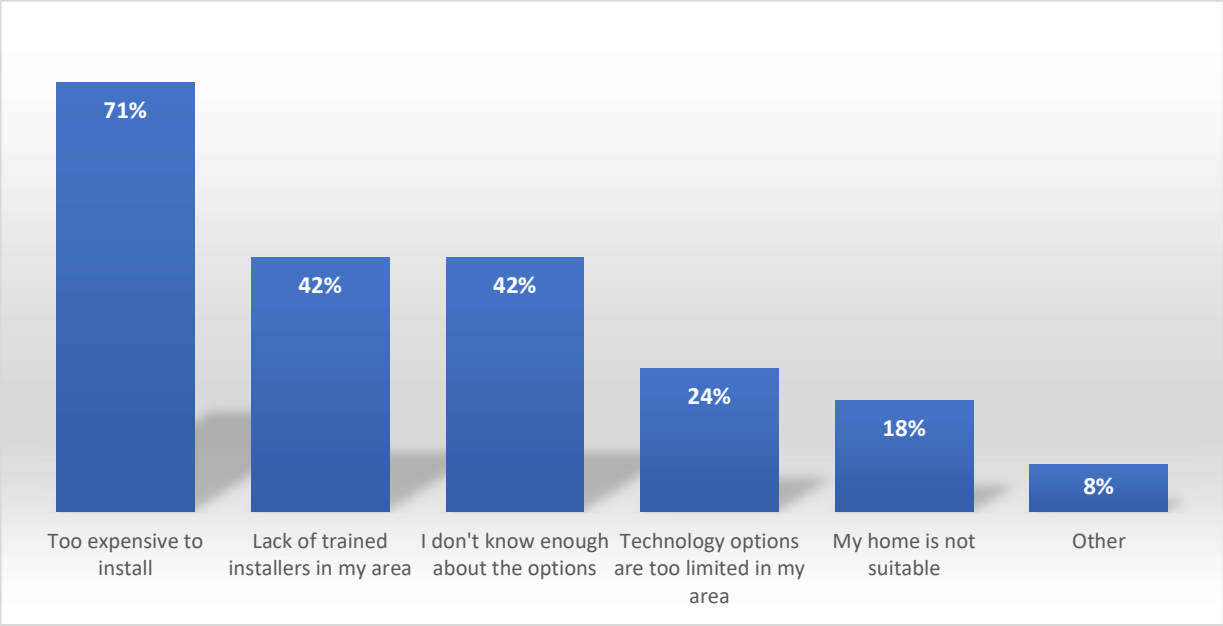


Over 90% of households in this survey expressed a desire to upgrade their household's energy to renewable energy. 60% would be interested in upgrade solutions with their neighbours and over 50% would be interested in some form of bulk purchasing scheme for the wider community to save

costs. Probably due to the scattered geography of the islands, district heating solutions were less popular.

3.20 Barriers to household investment in renewables

In being asked specifically what the barriers were which were getting in the way of investment to satisfy the latent demand identified, the following factors were identified (n=40):



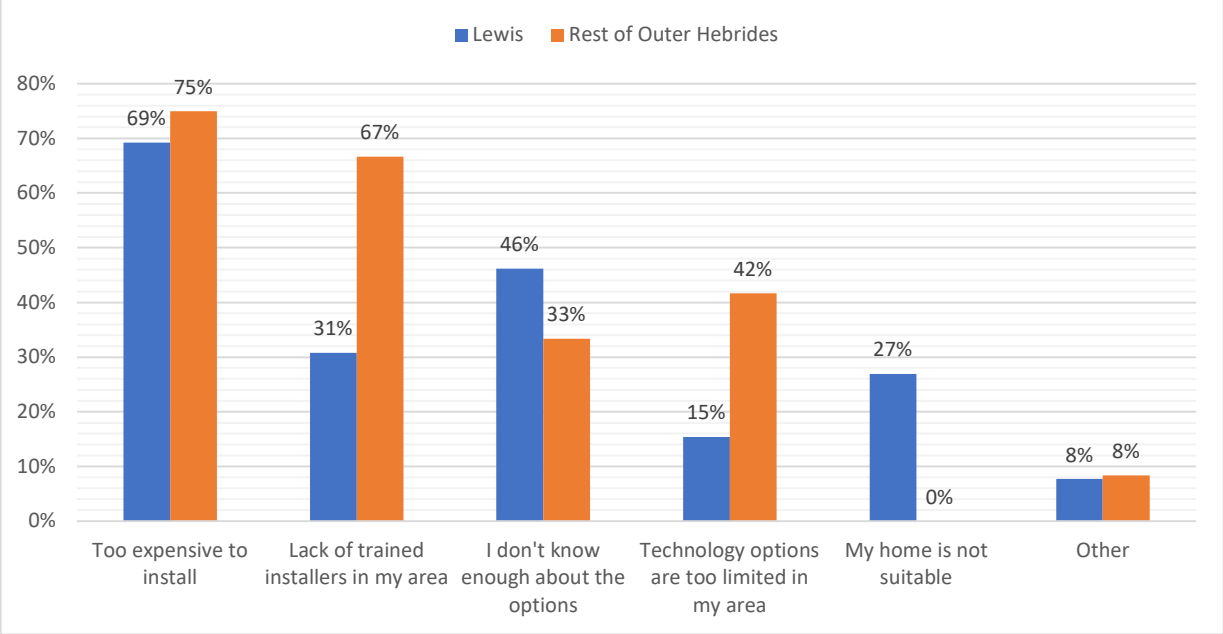
Even with all the noted social media offers of grant assisted supply and installation, 71% of householders in the islands, with admittedly imperfect information, are deciding that costs are just too high. Further barriers relate to perceptions around the supply of installers for renewables and ultimately householders deciding they just do not know enough about the options, technology and the appropriateness for their household to host such technologies, as being further barriers to investment for a significant minority of respondents.

3.21 Regional Difference between Lewis and rest of Outer Hebrides

The gaps between Lewis and the rest of the Hebrides revolve around the spread or presence of installers in the localalities across the islands and perhaps related, the perceived lack of technology upgrade options for

renewables which are viewed as being more limited outside of the main population centre of Lewis.

3.22 These problems are perceived as being significantly less in Lewis. In somewhat of a contradiction, it is also of note that in Lewis a higher % of respondents indicated they had a problem with information related to potential renewable options, perhaps ironically due to a higher perceived choice of options. Across the region despite local differences, 7 out of 10 agree that ultimatelty upgrade options for renewable energy at the household level continues to be perceived as being too expensive:



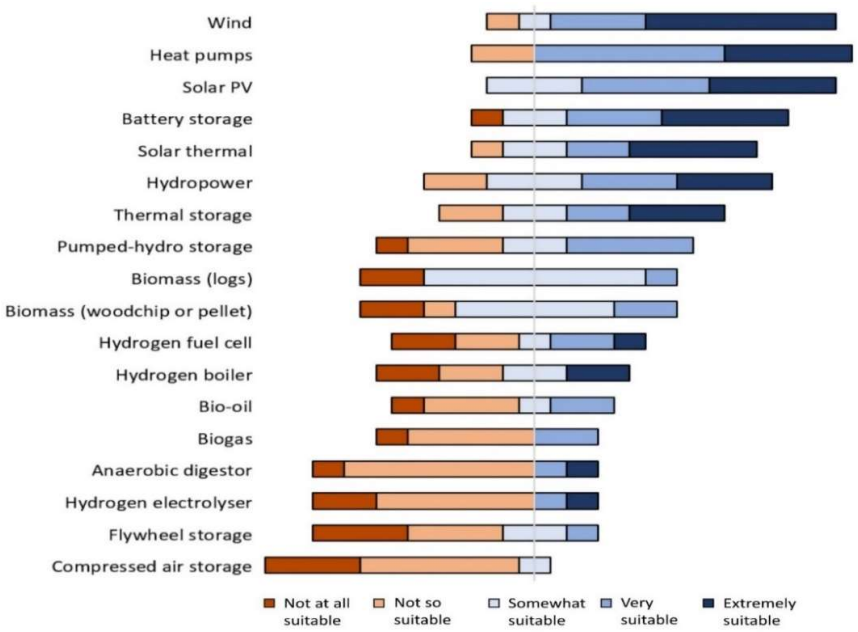
3.23 Views on Suitability of Differing Renewables Options for Island Households (Stakeholder perspectives)

The stakeholders (n=13) approached as part of this study included – sector-specific organisations with an energy remit, housing associations, the local authority, community trusts and private installers/contractors.

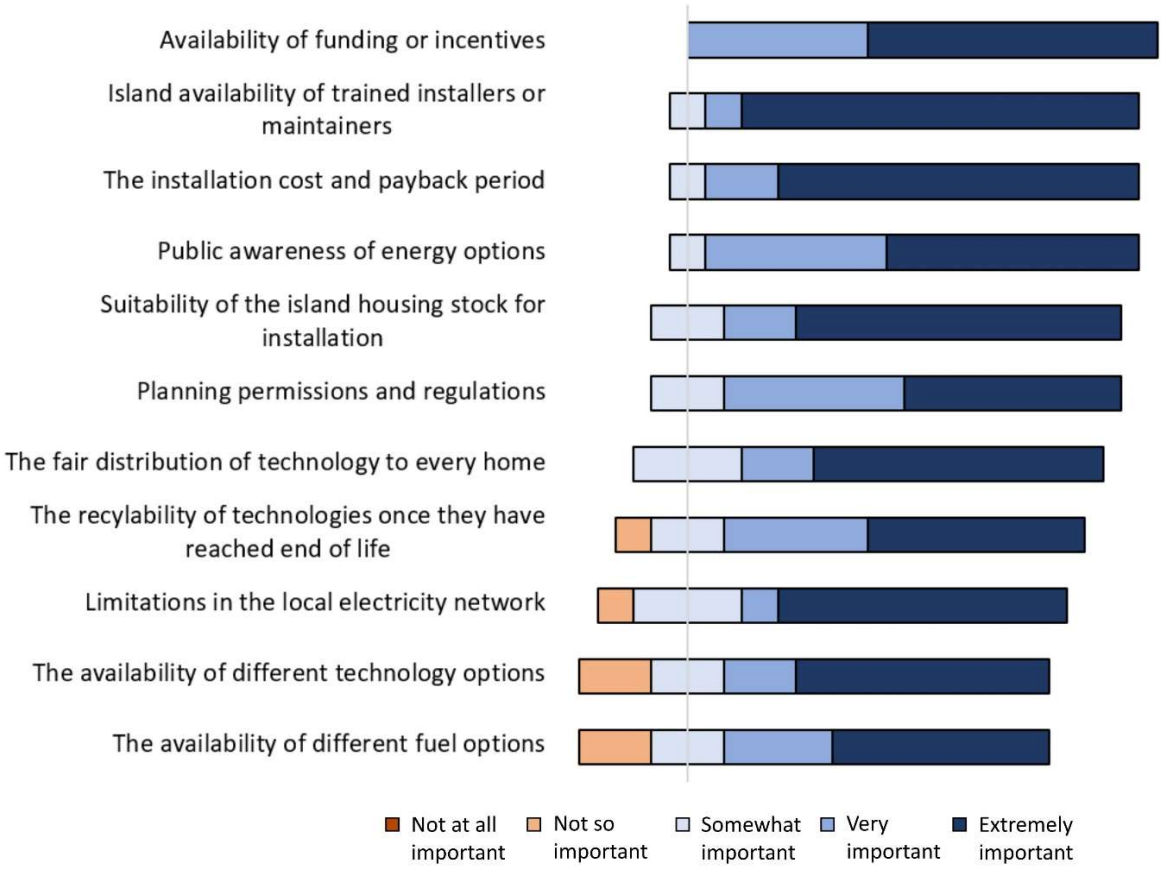
3.24 There were some similar responses, but also some notable differences. At the top of the renewable energy suitability rating for households was Wind. Household wind came second top from householders themselves. This is a very interesting finding as micro-wind for households is not a commonly

found technology across the islands and yet it is judged to be highly suitable by energy stakeholders and in-demand by domestic households in the islands. There is a clear opportunity here for further research and trialing of such technologies to test in the Hebrides envrionment. Given our wind resource in the Scottish islands one could suggest this is a good opportunity for us to lead in shaping this emerging technology prior to potential mass market penetration. What technological variations of micro-wind work best and most consistently in island locations? What are the pros and cons for households and the local grid?

3.25 Heat pumps were perhaps not surprisingly rated much higher by stakeholders, including potential installers, than by households as a suitable technology. Solar PV was the only technology in terms of suitability that not even one organisation disagreed about its suitability as a technology and as third choice in the ratings, was highly rated. Yet, solar thermal was considered less suitable in comparison to its level of latent demand amongst households. Lastly, the stakeholder group thought that household battery storage was also very suitable, although not being so highly rated in terms of demand within households. So, there are a few mismatches between the survey groups and their ratings that warrant further investigation and research:



3.26 **Perceptions on what issues are important to households**



This research was undertaken to ensure that there was not a significant mismatch between the views of households in the islands and the stakeholders across the community.

3.27 On top of the ratings was the availability of funding and this syncs with household views on the costs of upgrading, although the emphasis from households was as much on the potential of the technology to save on bills as it was the costs of installation. Similar to householders there was the recognition that the availability of installers and aftercare for maintenance was a very important factor too for householders. Other issues were also noted as being important such as the suitability of local housing for particular technologies and the awareness or lack of awareness of the detail of various options was also recognised.

Availability of trained installers and maintainers was deemed extremely important by nearly all respondents 11/13. The view here was that installation costs and and payback period is of high importance to progressing household renewables locally. This is in contrast to householders who viewed these issues surprisingly as having lesser importance. Perhaps because they would expect any funding incentives to cover much of this, if they were to invest.

3.28 Household comments on Renewable Energy in the Outer Hebrides (Extracts)

- "Information on grants for renewable energy would be beneficial issued to each household in Island and clear details on costs…"
- "We have just finished our new build and have installed solar PVs and a Sunamp battery. We would be interested in further renewables BUT needs to be cost effective AND finding installers on the islands is an absolute nightmare! Also air sourced heat pumps don't last due to the salty air."
- "Pretty much every house in [island] should have a domestic wind turbine, as production at the point of use is going to be one of the most effective ways of reducing central demand. But a tiny fraction do - I don't think that's primarily due to a lack of support or funding and definitely not from a lack of wind!"
- "We have a turbine. Once sold it, maintenance agents disappear and don't want to know, it's incredibly expensive once it goes wrong which it does frequently and there is virtually no help. It is noisy in high winds , but over all a good buy, but so wish I knew more before purchase.. no help anywhere when things go wrong."
- "Many adverts I respond to for PV and Storage have no agents covering the Western Isles. Why is ac battery storage not plug and play? there's no MCS accreditation requirement, so why can't any local electrician fit it? Bring back Feed-in-tariff that guaranteed an income for 20 years - so you could borrow easily."
- "Were grants, interest free loans available I would consider; otherwise installation is too expensive."
- "Have solar PV installed, enquired regarding a heat pump. Retrofitting to an older house was going to require complete renewal of central heating pipework and radiators, plus various alterations and were quoted in region of £25k. Far too much to justify in terms of reduced bills"

A rich depth to the comments helps illustrate the very real frustrations around knowledge and service gaps that are apparent amongst island households (n=40), over 90% of whom are indicating a preference to upgrade if possible or at the earliest feasible opportunity to renewables.

3.29 Stakeholder comments on Renewable Energy in the Outer Hebrides (Extracts)

With a range of views on where the priorities reside this implies that there is the need for a regeneration strategy/plan for the islands with across-the-board buy-in so that focus can work towards collectively common goals.

- “Main focus should be on insulating the island homes. This will help reduce dependencies right away. Once this is sorted then renewable energy can be a priority.”
- “I believe with better education and the dispelling of silly myths that technologies such as Air Source Heat Pumps don't work in certain types of homes, the island could be largely powered by renewables in the not so distant future.”
- “I would like to see a lot more emphasis on tidal power - it is a guaranteed source that has not been harnessed enough.”
- “Not optimistic, grant schemes carry inappropriate conditional measures and beyond-warranty work on systems is expensive and hard to find trained engineers. e.g. Mitsubishi won't entertain a service plan for here.”
- The reluctance of Government to embrace the opportunity to properly invest in renewable technology whether it be wind, wave, solar and hydrogen will just leave us continually lagging behind the curve.”
- “There seems to be an eagerness to promote hydrogen – Stornoway. But out with the town the technology is much earlier in development”

3.30 Specific Project Milestones

Work Package 5 – Household Renewables

The following table outlines progress made against key project milestones for WP5.

WP5 milestone	Due date	Milestone status
Begin data collection in the field	1st May 2023	Achieved.
Begin analysis of collected data	30th June 2023	Achieved.
Submit final report	4th August 2023	Achieved

As shown above, all milestones have been met for this work package. Specific detail on the outcomes of the research are outlined from section 3.13 of this report onwards.

Work Package 6 – Household Energy Efficiency

The following table outlines progress made against key project milestones for WP6.

WP6 milestone	Due date	Proposed amendments
Begin data collection in the field	1st May 2023	Achieved.
Begin analysis of collected data	30th June 2023	Achieved.
Submit final report	15th Sept. 2023	Achieved

As shown above, all milestones have been met for this work package. Specific detail on the outcomes of the research are outlined from section 3.4 of this report onwards.

3.31 Summary and Conclusions

Context important – with the lowest salaries and household incomes in UK found in the Outer Hebrides, a rapid and costly upgrading of housing stock by private means may prove difficult. So, there is a requirement to plug gaps where it is possible, in best 'value for money' areas.

Traditional measures (WP6) - such as double-glazing and loft insulation have seen significant uptake in response to the availability of grants and national and local authority funded area-based schemes. The next phase of energy efficiency upgrading needs to be targeted and immediate – e.g. external/internal/ cavity wall insulation/ underfloor insulation.

Barriers (WP6) - need to be urgently overcome and are primarily related to understanding complexity of grant availability and application process and also lack of understanding of what is most important for a given house location – e.g. need for energy audits/visits and advice.

Householders in the islands choose (WP5) - Solar PV, Wind and Solar Thermal as their top three technologies they would wish to integrate into their home. Heat pumps and battery storage are considered as a higher area of suitability amongst installers and agencies, but less popular with householders. The reason for heat pumps, in particular, is that the fabric of the housing stock becomes crucial, and major challenges exist for those homes that do not conform.

Over 90% of respondents (WP5) - indicated they would happy to invest in renewable energy technologies for their home, but 71% indicate it is just too expensive. In the rural areas (outside of Stornoway) there is a lack of trained installers and this remains an important barrier to renewable upgrades.

According to householders (WP5 & 6) - the primary factor to entice investment would be the ability to save money on their bills. The potential savings need to be promoted more clearly – e.g. of solar thermal investment in the Hebrides for an average 3-bed household. According to stakeholders, the

most important factor they experience on whether people upgrade, or not, is linked to the availability of appropriate funding incentives for householders – e.g. the availability of grant funding as a proportion of total costs.

Solar Thermal (WP5)- a value-for-money investment given days with lack of direct sunshine? Popular potential choice but uncertainty on its appropriateness.

Household wind energy (WP5) - identified by both householders and stakeholders as a high priority. Need to investigate further potential technologies in recognition of this natural resource.

Community-level wind generation in South Uist.

3.32 RECOMMENDATIONS

The sample data from this research undertaken by two UHI final year Masters students to count towards their MSc Sustainable Rural Development provides the reader with a series of invaluable sample insights into the 'state of play' with progress in the household sector move towards a 'net zero transition' in the Outer Hebrides in 2023. This baseline data can provide the basis for further follow-up research in the future and in its own right, provides some insights and findings of more immediate interest to action locally in the Outer Hebrides.

I. FURTHER RESEARCH (WP5 & 6): Given low level of household incomes in the islands then we need to investigate which actions and transition technologies will give us 'most bang for our buck' at the household level. What should be the priorities for cash poor householders located in the Outer Hebrides on a windswept group of islands? Which investments will make most impact in reducing their bills and impact on CO_2 emissions?

II. DEVELOP (WP5 & 6): There is an urgent need for the development of a 'one-stop-shop' service and associated online portal shared by Community Energy Scotland (CES), Tighean Innse Gall (TIG), Comhairle nan Eilean Siar (CnES), Hebridean Housing Partnership HHP – where Outer Hebrides residents can seek advice and information and also get the latest news and updates from the multi-sector partnership on grants, technologies andsuccess stories regarding domestic emergy efficiency and renewable energy technologies.

III. DEVELOP (WP5 & 6): Due to an acknowledged lengthy and complicated grant/loan application process to fund the installation of energy efficiency measures and domestic renewable energy technologies, this means only the most able, with the highest capacities in rural areas are able to upgrade. Households with lesser skills and capacities will be excluded from upgrading due to this difficulty, yet will arguably be those most in need. The need for social equity in terms of a just transition requires that households are not excluded due to their capacities. Additional support services via a social enterprise (expanding a current remit or new start) should be put in place to support a more just transition in the islands.

IV. RESEARCH AND DEVELOP (WP5): Five technologies have been identified as being the most sought after (by households) and suitable (by stakeholders). The challenge will be to research and monitor, in some instances and trial in others, to provide specification and performance sheets for several differing setups for each technology in the Outer Hebrides. This will provide the key performance data that householders are seeking prior to investment.

V. This will have to be updated tri-annually to ensure future currency of information. Performance sheets needed for several installation variants of the following technologies:

1. Solar PV
2. Micro-Wind
3. Solar Thermal
4. Heatpumps
5. Battery storage

VI. RESEARCH AND DEVELOP (WP5 & 6): A recognised barrier from the survey data revolves around the availability and indeed accessability of installers for household upgrades for energy efficiency and renewable technologies. Even where MCS certified business do exist, they appear to have a low prioritiy for individual household upgrades, unless at scale. A practical solution would need to be progressed:

- Develop a new training facility within the Future Energy Lab at the UHI campus in Stornoway to work with current installers to train their staff at a subsidised rate with the caveat they commit to a certain number of individual household renewable upgrades (with continued aftercare included) within 12 months, for each member of staff trained.

VII. RESEARCH (WP5): Two technologies in particular were identified by households as being in high demand, but yet lack of knowledge and information on their appropriateness was apparent.

- Firstly, micro-wind at the household level seemed an obvious technology to install, given our healthy level of natural resources in this area. Few installations in the islands exist in comparison to other more common technologies. An opportunity here to research the most appropriate technologies in the Outer Hebrides (or even design a new technology) and lead the field in this renewable area, providing performance details and specifications of top choices might help convert the existing expressed demand.
- Secondly, solar thermal in the Outer Hebrides – what are the likely outcomes on various South facing perspectives. Is it a sensible investment? Install and monitor for 12 months several systems to develop specification and information sheets to aid investment decisions for households.

VIII. PLAN (WP5 & 6): In view of the findings of this report and the complex nature of seeking to overcome the challenges, a full 5-year multi-agency plan should be produced to target and focus collective efforts.

APPENDIX 1 – The Co-Creation process as a facilitator of outcomes

The co-creation experience as part of this project is very similiar to more familiar processes used with modern day students learning on distance eduction courses. It is also something very familiar to those of us working in rural and community development. It is a means, in effect, to develop a 'community of practice' who are invested in particular goals and able to provide the scaffolding for the processes associated with the construction of knowledge. This is both a facilitation role and a guiding role which from a multi-stakeholder partnership, in this instance, creates the conditions to attain optimised outcomes. This is progressed by undertaking an inclusive, participatory approach to problem-solving through partners who share a common purpose and who are willing to learn from each other and share ideas. The emerging social connections are also important contributors.

This co-creation process facilitates and guides knowledge creation around which the community of practitioners develops and through sharing and maintaining relationships, add to the collective core knowledge of all. In this instace the community of practice that has developed around the co-creation process includes:

	Shona MacLeod	Carbon Neutral Islands
	Joe MacPhee	University of the Highlands and Islands North, West and Hebrides
	Dr Michael Smith	University of the Highlands and Islands North, West and Hebrides
	Donnie MacMillan	Comhairle nan Eilean Siar
	John Cunningham	Comhairle nan Eilean Siar
	Carolyn MacPhee	Comhairle nan Eilean Siar
	Finlay MacLennan	Community Land Outer Hebrides
	Brian Whittington	Climate Hebrides
	Caroline Willis	Climate Hebrides
	Euan Scott	Barra and Vatersay Community Ltd
	Donald MacSween	GreenspaceLive!
	Neil MacKinnon	Galson Estate Trust
	Kirsty Macleod	Tighean Innse Gall
	Donna Smith	Tighean Innse Gall
	Laura Hutton	Islands Centre for Net Zero
	Sarah Marshall	Highlands and Islands Enterprise
	Chantal Geyer	Highlands and Islands Enterprise
	Donald Murray	Highlands and Islands Enterprise
	Matthew Logan	Community Energy Scotland
	Beatriz Maroto	Community Energy Scotland
	Hannah Sharp	Community Energy Scotland
	Hannah Macdonald	Community Energy Scotland

The challenge will be to maintain this community of practice formed around the co-creation process in the coming months and years.

What is perhaps missing now and was missing during the co-creation process was a common online space, perhaps an MS Teams group, where the community of practice partners could share their perspectives and networks and use each other's skills to problem solve collectively and so add to and enhance the collective knowledge of the whole through participatory co-creation methods.

In my view, a similar opportunity exists to extend this new co-creation partnership to form a community of practice around the emerging ICNZ in which all the partners in the RIPEET pilot also have a stakeholding. Through such a partnership a new tailored regional plan of priorities could be developed out of the findings of the RIPEET project. Further benefits link to other partner interests also brought together through a continued vision of collective problem-solving and knowledge construction for the betterment of the area in progressing a just transition to net zero, whilst tackling fuel poverty in particular, at the household level.