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**DO SOLAR PV AND SOLAR THERMAL
INSTALLATIONS AFFECT THE PRICE AND
SALEABILITY OF DOMESTIC PROPERTIES IN
OXFORD**

by

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ABSTRACT

Research into the impact of renewable energy or energy efficiency on the value or saleability of domestic properties is currently scarce. In response this study investigates aesthetic and social responses to solar technology in the Oxford property market amongst prospective property buyers, estate agents and householders.

The study gathered data by issuing questionnaires to prospective property buyers, interviewing estate agents and surveying householders in properties with solar panels.

Responses from prospective buyers indicated that solar panels increase the saleability of properties in Oxford but that the effect on value is negligible. Responses also implied that prospective buyers' purchase decisions are highly influenced by information on fuel bill savings. Surveys of households with solar indicated that this information is not currently being provided.

The study concludes that currently demand for properties with solar in Oxford is not being reflected by property values and that this may be linked with the fact that householders are currently not being provided with key information that might influence their purchase decisions.

It recommends that in future property professionals provide prospective buyers with key information about solar panels and that wider studies seek to establish whether demand for properties with solar exists on a national scale.

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Abbreviations

EE	Energy efficiency
EER	Energy Efficiency Rating
EPC	Energy Performance Certificate
EST	Energy Saving Trust
FITs	Feed in Tariffs
HSN	Home Sale Network
PAYS	Pay as You Save
NPV	Net present value
RE	Renewable energy
RICS	Royal Institute of Chartered Surveyors
WTP	Willingness to pay

1. INTRODUCTION

1.1. Context

Research into value and energy efficiency often focuses on economic paybacks rather than looking at investments holistically and therefore does not take into account that invariably energy efficiency and renewable energy installations are fixed assets, i.e. seldom transferred from their installed locations.

In the domestic housing market, where home-owners move on average every 12 years (HM Government, 2009) there is potential for EE or RE assets to be transferred from the original owner upon sale of the property. Where this occurs there is potential for the perceived 'value' of these assets to have influence on the property price.

As the 'Warmer Homes' strategy states:

energy efficiency is no replacement for a good location, being an appropriate size, the building being in good condition and all the other factors that influence buyers, however, it can play a role in influencing the value of a property (HM Government, 2009, 33)

However, to date, there has been a scarcity of studies exploring the magnitude or direction of this influence.

It is of particular interest to explore the direction of influence as, to date, no studies have explicitly explored whether EE / RE have a positive or negative effect on domestic property prices.

The aim of this study is to explore aesthetic and social responses to a highly visible renewable technology: solar thermal and solar photovoltaic panels. The study focuses on a particular property market: domestic properties in Oxford and uses self-completed questionnaires, face-to-face surveys and interviews as primary sources.

These sources are used to investigate current attitudes of homebuyers and property professionals towards domestic solar energy. The results are then used to form conclusions as to whether solar panels have any effect on the value or saleability of properties on which it is installed and what factors, individuals or organisations, have an influence on these dynamics.

1.2. Structure

The study starts by reviewing the current literature on sustainability and value, followed by a section outlining the methods used, after which the results, analysis and conclusions are presented. The study concludes with recommendations on how the findings can be used to assist stakeholders.

2. LITERATURE REVIEW

2.1. Introduction

In the past decade literature on sustainable buildings has started to diverge from that solely focussed on technological issues and started to explore perceptions of the value of sustainable or 'green' features (Sayce et al, 2010, p30).

In particular government policy documents have started to focus on new forms of incentive intended to increase the 'value' of renewable and energy efficiency installations to householders; for example Feed in Tariffs and Pay as You Save schemes (HM Government, 2009, & The Coalition, 2010)

In the last year policy documents have for the first time proposed a potential link between energy efficiency and domestic property prices (HM Government, 2009).

Choice based studies suggest that individuals would be willing to pay up to 13% more for properties with certain energy efficiency improvements (Banfi, et al, 2005) and around £2,380 for solar PV and £2,900 for solar thermal systems (Scarpa et al., 2010). However valuation studies suggest that property prices are driven by demand and, as yet, there is little evidence to indicate increased demand for sustainable or efficient buildings (RICS, 2010 & Sayce et al. 2010).

Literature exploring consumer attitudes towards EPCs, as an indication of attitudes towards efficiency and sustainability in the domestic property market, imply that they currently have low credibility with some property professionals (Home Sale Network, 2010 & RICs, 2010) and limited impact on householder choices (NHER, 2009 & EST, 2009).

These sources are reviewed in detail below. The conclusion of the section summarises existing research in this area and how this study fits into that picture.

Literature Reviewed¹

- 1) Warm Homes, Greener Homes: A Strategy for Household Energy Management, HM Government
- 2) Energy Efficiency and Value Project, RICS
- 3) Willingness to pay for energy saving measures in residential buildings, Banfi et al

1 Full references are shown in the Reference section

- 4) Energy Performance Certificates: Home Truths, Energy Saving Trust
- 5) Energy Performance Certificates make little impact on buyers according to survey, Home Sale Network
- 6) Eco Chic or Eco Geek. The desirability of sustainable homes, Executive Summary, Sponge Sustainability Network
- 7) Sustainable Property: A Premium Product? Sayce et. al
- 8) Energy Performance Certificates. Seizing the Opportunity, NHER
- 9) Willingness to pay for renewable energy: primary and discretionary choice of British households for micro-generation technologies, Scarpa et al

2.2. Reviews

- 1) *Warm Homes, Greener Homes: A Strategy for Household Energy Management, 2009, HM Government*

This strategy published by the outgoing Labour government in 2009 outlines various policies to encourage energy efficiency and renewable energy in the domestic sector, particularly through Pay as You Save or “green finance”.

Key statements

The documents states that home-owners move, on average, every 12 years and implies that this acts as a disincentive to investment in energy efficiency as this is less than the payback time of many higher costs installations (p9).

The policy proposes a Pay as You Save scheme that would allow the cost of upgrades to be attached to the home (p9) and secured against the value of the property. Primary legislation would be needed in order to tie the PAYS loan to the property rather than the home-owner (p32).

Key quotes

“A key issue influencing home-owner motivation to invest in home energy improvements, and which could help to promote the widespread take-up of PAYS, is the extent to which such investments are reflected in property values” (p34).

“An efficient home is cheaper to run, but we are not yet seeing this being reflected in house-buyer demand or in property prices. A price differential between energy efficient and inefficient homes, coupled with the added prospects of lower fuel bills, would offer home-owners greater incentive to invest in energy efficiency measures” (p34)

The new coalition government have indicated their support for PAYS type schemes (The Coalition, 2010)

2) *Energy Efficiency and Value Project, Final Report, March 2010, RICS*

As a result of the Warmer Homes policy document the then government commissioned this report by the Royal Institute of Chartered Surveyors into the link between value and property prices.

Key statements

The report states that the additional value of energy efficiency features derives from demand for them and that this in turn is linked to availability of, and confidence in, these features. It refers to a “vicious circle” where the market does not supply energy efficiency because there is no demand, and buyers do not demand it because there is no supply (p4)

The report asserts that valuations by surveyors can only reflect demand rather than correct perceived market failures; “value is inextricably linked to demand” (p16) but that there is a role for surveyors and other property professionals in influencing demand: “Property professionals are involved in the buying and selling process in a number of key areas, and are therefore well equipped to assist in raising public and stakeholder awareness” (p10).

The report recommends that instigating behavioural change in homebuyers is “critical” (p6) in order for energy efficiency to be reflected in property prices and suggests that this could be brought about by two methods (i) independent, authoritative and understandable information for consumers on energy efficiency features, including consumer protection and (ii) improving skills of, and guidance for, property professionals.

Existing information, from Energy Performance Certificates, was deemed by RICS members to have “low market credibility” (p16). The report emphasises that property professionals need a better understanding of consumer drivers and recommends government funded market research to address this information gap (p13)

Limitations

Assertions on the lack of consumer information appear to be based on unsubstantiated observations from a regional study²:

3) *Willingness to pay for energy saving measures in residential buildings, 2005, Banfi et al*

This study entailed the statistical interpretation of data collected through 'choice experiments' with individuals in Switzerland concerning hypothetical properties with various EE features, including heat recovery ventilation, glazing and insulation.

² *Government National Carbon Targets and Regional Housing Market Dynamics* (Monk et al, 2010)

Key findings

The 'willingness to pay' for an enhanced insulated façade was 3% market value and 8-13% of the market value for ventilation systems in new builds or insulated windows in old buildings.

Both these figures represent more than the cost of the measures therefore the authors assert that it would be “economically reasonable” for owners or housing promoters to invest in energy saving measures (p515)

However they state that legal, structural and socio-economic barriers, lack of information about the advantages of EE measures and lack of methods to quantify these advantages in economic terms explains the lack of market penetration of these measures.

Therefore the authors conclude that communications, information and finance are needed to speed up the process of cost reduction measures.

Limitations

The authors acknowledge the study was conducted in a particularly hot summer therefore this might have increased the WTP for ventilation systems.

- 4) *Energy Performance Certificates: Home Truths, October 2008, Energy Saving Trust*

The Energy Saving Trust, the government-funded organisation that provides energy advice to UK households, commissioned a survey in 2009 of 2,146 householders to establish attitudes towards EPCs

Key findings

Of those surveyed:

- 40% of people know what an Energy Performance Certificate is
- 78% think it is important to look at the Energy Performance Certificate rating before buying a property
- 70% would consider renegotiating the price paid for a property if they discovered it was highly inefficient
- those who would renegotiate said they would try to drop the price to buy or rent by an average of 11%

Key quote

“An energy efficient home will not only command higher rental value and boost chance of a property being rented but can also increase the value by an average of £3,350 when it comes to being sold” ('Introduction')

Limitations

There is a potential discrepancy amongst the finding, e.g. only 40% of people know what an EPC is but 78% believe it is important to find out the EPC rating before purchasing a home. This implies the majority of people think EPCs are important in property purchases despite not knowing what they are. This could be explained by lack of householder information about EPCs but requires more explanation than afforded by EST's report.

The assertion that EE could increase the value of a property by an average of £3,350 is not referenced but it may derive from the average stated price renegotiation of 11% downwards for a "highly inefficient" home. If this is the case then this figure is likely to be an over-estimate as only 70% said they would renegotiate based on efficiency and only where the home was "highly inefficient".

- 5) *Energy Performance Certificates make little impact on buyers according to survey, 30th September 2009, Home Sale Network*

The Home Sale Network is a national network of independent estate agents. This press release is the result of a survey of an unknown number of its members.

Key Findings

- 57% of HSN members have never been asked about a property's EPC
- only 6% of those surveyed reported incidents when an EPC was used to renegotiate price
- 87% wouldn't advise vendors to take low cost steps to raise the EER of their home

Limitations

There is no indication of how many people were surveyed or whether the questions were phrased in an objective way.

- 6) *Eco Chic or Eco Geek. The desirability of sustainable homes, Executive Summary, 2006, Sponge Sustainability Network*

This 2005 study focused on the demand for sustainability features on new homes and was informed by a survey of 501 property buyers and 4 discussion groups.

Key findings

- 52% of home-owners are prepared to pay more for a house with high environmental standards
- 70% claim to know little or nothing about sustainable homes

- 75% are concerned over how much electricity and gas new homes use

The discussion groups unveiled positive associations with sustainable homes; that they were modern, high tech and fashionable. However the report maintains that it is yet to be proven that there is demand for sustainable homes.

Limitations

A potential contradiction exists regarding the finding that home home-owners would be prepared to pay more for sustainable homes despite knowing little about them.

7) *Sustainable Property: A Premium Product? June 2010, Sayce et. al*

This paper is a review of existing literature on value and sustainability. It is a working paper pending the findings of the RICs study but serves as a useful summary of studies in this area, most of which focus on commercial property prices and rents.

Key Findings

Of the articles on value and sustainability reviewed less than half (37%) had value as a key consideration (p10)

Some studies indicate that there is evidence that sustainable property is seen as “lower-risk” (p22), “future proof” (p25) and “easier to finance” (p25) though this is unlikely to be relevant to the domestic property market.

The paper asserts that the large amount of evidence gathered by surveys cannot be seen as proof of value as they indicate intentions not to actualities: “Surveys collectively point to sustainability being a desirable feature for which some say they will pay extra, but [they] may not actively put their intentions into practice” (p22)

However the authors state that transactional data may not tell the whole story either; “The property market is seldom perfect and although value may exist for one party it will not always be fully reflected by transactional evidence” (p18)

Limitations

The review only examined English language articles.

8) *Energy Performance Certificates. Seizing the Opportunity. Report 1, December 2009, NHER*

This report by NHER, a body that accredits EPC assessors, looks at the potential impact of EPCs and the take up of energy efficiency improvements recommended for private homes in England & Wales. The results derive from a survey of 300 homebuyers and their EPCs.

Key Findings

- 68% remember seeing an EPC
- 79% read the information in their EPC
- 32% of those who read their EPC have implemented some of the measures

Time, hassle and potential cost were quoted as barriers to action.

The study tacitly acknowledges a credibility gap surrounding EPCs: “EPCs must be recognised as reliable and impartial” (p32) and highlights lack of awareness: “Unless action is taken to ensure home owners see and understand the EPC... this valuable opportunity [to implement EE measures] will continue to be largely wasted”

Limitations

Although the paper states that “roughly one third of those who read their EPC had made some of the suggested energy efficiency improvements” this equates to only 17% of all those surveyed, when those who did not remember seeing or reading their EPC are taken into account.

- 9) *Willingness to pay for renewable energy: primary and discretionary choice of British households for micro-generation technologies, June 2009, Scarpa et al.*

This study explored household preferences by asking 1,214 individuals to choose between various hypothetical scenarios.

Key Findings

Respondents were willing to pay £2,381 ± 244 for solar photovoltaic and £2,903 ± 255 for solar thermal (p135). The study suggests consumer's time horizons are relatively short; less than 3-5 years, equating to a discount rate of 34%.

The authors suggest that the lack of market penetration of renewable energy is because “costs are greater than respondents WTP for these technologies” and also solar thermals' relative popularity can be explained by the smaller gap between its price and people's WTP (p135).

Limitations

The outcome of the study is dependent on the scenarios presented to householders, e.g. that extra storage would be needed for hot water tanks.

2.3. Conclusion

The literature indicates the pitfalls of determining how renewable and energy efficiency features affect the 'value' of properties, in particular the inaccuracy of both surveys and transaction data in representing actual value.

However the review identifies a clear need for further research in this area. Current literature is split between surveys and choice experiments, which suggest that consumers are 'willing to pay' more for RE and EE measures, and current professional opinion which indicates that 'sustainable' features do not currently add value to properties.

As a whole we can conclude that, at present, information for consumers, property professionals and policy makers on the link between property value and sustainability is insufficient and, as such, guidance for policy-makers on how to encourage investment in domestic EE and RE measures³ is incomplete.

It is the need to address these issues that this study is dedicated. The methods used and their limitations will be discussed in the next section.

3 For example through instruments such as FITS or PAYS

3. METHODOLOGY

3.1. Area of study

The question to be answered by this study is “Do installations of renewable energy, specifically solar PV and solar thermal, affect the price and saleability of domestic properties in Oxford?”

Issues to be explored by the research include:

- aesthetic and social attitudes towards solar energy
- current expectations surrounding 'value' and solar energy

3.2. Hypothesis

Taking into account the publicised environmental and financial benefits of installed solar hot water and solar electricity systems (EST, 2010a & 2010b), it would be logical to conclude that solar energy installations might either add value to, or increase the saleability of, properties on which they are installed.

The hypothetical amount that an installation might add could be expected to be a product of⁴:

- expected fuel savings per year (x)
- expected number of years during which savings will accrue (i)
- consumer discount rate (r)

These parameters can be expressed as net present value to the house buyer as:

$$NPV = \sum_{i=1}^n R / (1+r)^i - C$$

Where R is the expected annual revenue, r is the consumer discount rate, i is amount of years over which the savings will accrue and C is the initial cost⁵.

If we assume that the average Oxford house buyer stays in a property for 12 years (HM Government, 2009), the average saving per year is £50 for solar

4 Maintenance costs, annual depreciation and fuel price rises have been excluded under the assumption that the householder would not know, or take into account, this information at the time of purchase

5 Expected fuel price rises have not been included

thermal⁶ (EST, 2010a), £190 for solar PV (EST, 2010b) and the capital cost to the house buyer is zero.

Therefore:

$$i = 12$$

$$R (\text{thermal}) = 50$$

$$R (\text{photovoltaic}) = 190$$

$$C = 0$$

At a consumer discount rate of 8.3%⁷, this gives us a net present value of £371 for solar thermal and £1,410 for solar PV. With a discount rate of 20% this decreases to £222 and £843 respectively⁸. Finally using the social discount rate of 3.5%, as used by the UK treasury, increases the NPVs to £483 and £1836 (see Appendix 9.5).

Therefore, based on these calculations, we could expect solar thermal panels to add between £200 - £500 to the value of a property and solar photovoltaic to add £800 - £1,800.

However the assumptions involved in forming this hypothesis are significant; we have to assume that:

- the house buyer has reliable information on the savings associated with the solar panels
- the house buyer knows at the time of purchase how long they will stay in the property

Perhaps more significantly we need to assume that no other information or perception affects their decision, such as familiarity with the technology, association with 'green' issues, or the converse, or aesthetic opinions, positive or negative.

In reality these are likely to be the deciding factors in any one individual decision and the 'direction of travel', e.g. whether the panels represent a present value or present cost⁹, will be different according to the individual's perceptions.

6 Saving from solar thermal for property on mains gas

7 If the householder moves after 12 years then the net present value when $t=12$ will be zero. Therefore the discount rate is 8.3% ($100 / 12 = 8.333$)

8 Consistent with a house buyer who anticipates moving after only 5 years

9 A net present cost would be consistent with an assumption that maintenance and running costs would exceed savings

It is possible that a study of significant scale would be able to control for these perception-based decisions and identify whether the financial impact of installations on property prices is positive or negative and thereby test the NPV parameters. It is clear that this study does not have the breadth or scope for this.

Therefore the hypothesis to be challenged by this study is:

Installations of solar photovoltaic and solar thermal panels add value to, or increase the saleability of, the properties in Oxford on which they are installed

The methods the study uses to inform this hypothesis are shown in the table below and described in detail in Methods Used.

Table 1 : Methods used and aims

Method	Aim
Questionnaires; electronic and hard-copy, self-completed by potential property buyers	To gauge consumer attitudes to solar thermal and solar photovoltaic panels and explore relative importance of various factors and agents
Interviews; one-to-one with participating estate agents	To explore their own, and their client's, attitudes to renewable energy and energy efficiency in relation to house prices and gather data about properties sold with solar energy
Surveys; in person and by self-completion with households with of solar installations	To gauge householders attitudes towards installations in relation to property prices and gather data on installations.

3.3. Geographic focus

The study is focused on the area of Oxford City, defined by the area under the jurisdiction of Oxford City Council. The reasons for this limitation are multiple:

1. the limited breadth allows the topic to be examined in greater depth
2. it facilitates assumptions about housing stock, population and demography
3. it ameliorates regional property market discrepancies
4. it allows the study to focus on an urban area where properties have many homogeneous features¹⁰

¹⁰ E.g. all properties have access to mains gas

Information about the author

At the time of the study the author was an employee in the Environmental Development service of Oxford City Council, therefore the geographic focus allowed the author to use existing contacts and networks.

3.4. Methods used

A mixed methodological approach has been adopted within this study, incorporating qualitative and quantitative methods, see below.

Questionnaires

A questionnaire was designed to gather information on the attitude of potential property buyers towards properties with visible solar panels and explore what might influence their purchase decision, see Appendix 9.2.

In order to gauge attitudes to the aesthetics of solar panels two images were used in the questionnaire; an evacuated tube solar thermal panel and a 165W Mitsubishi solar photovoltaic panel.

The questionnaires were distributed in hard copy and electronically to potential property buyers between 1st and 26th July 2010 via eight participating estate agents (see Appendix 9.1). Estate agents were identified by a Google search, agents were then phoned and asked whether they would like to participate in the study, see the script used in Appendix 9.6 and the full contact log in 9.9.

This geographic split of participating agencies is fairly consistent with their distribution in Oxford as shown in Figure 1, although no estate agents in central Oxford or South Oxford participated in the study.

As an incentive to encourage participation respondents were offered entry into a prize draw for a £30 Marks and Spencer voucher. Estate agents were given draft text to send out with the electronic questionnaire (Appendix 9.3) though not all agents used this wording. Estate agents displayed hard copies in their offices or gave them to clients when on visits.

The average response rate was 4% made up of 7% of hard copies and 2% of e-mails. The distribution strategy and sampling rate are shown in detail in Table 2.

At the end of the study questionnaires were collected from estate agents and in-putted into a spreadsheet to enable data analysis.

Figure 1: Geographical distribution of all estate agents in Oxford, participating agents shown in red¹¹



Table 2 : Questionnaire Distribution and Response Rates

Number of estate agents participating	Number who returned questionnaires	
8	6	
Number of hard copy questionnaires distributed	Number of hard copy questionnaires returned	Response rate (hard copy)
350	25	7.1%
Estimated number of electronic questionnaires distributed	Number of electronic questionnaires returned	Response rate (electronic)
330	5	1.5%
Total questionnaires distributed	Total returned	Response rate
680	30	4.4%

11 Red markers represent participating estate agents and red markers with dots interviewed estate agents.

Interviews

Questions for estate agents were drafted intended to gather information about properties sold with solar energy, explore their attitudes to renewable energy and energy efficiency and gauge their opinions on client preferences, see interview format in Appendix 9.18.

All participating estate agents were asked whether they would agree to be interviewed about renewable energy and house prices and 64% of the participating estate agents agreed to be interviewed within the time frame of the study.

Between 26th July and 5th August the author interviewed members of staff at five estate agencies. Interviews generally lasted between 10 and 20 minutes, and followed a semi-structured guide.

Interviews were transcribed, see Appendix 9.4, and the author read, reviewed and re-read the transcripts, drawing out the key themes from the data. These themes are outlined in the Section 5.2, Analysis. Discrete data was entered into a spreadsheet to facilitate data analysis. These results are displayed in Section 4.2, Results.

Surveys

Surveys were designed to gather data from householders with solar installations to gauge attitudes towards the installation and property value. Questions were tailored to reflect whether the householder had installed the panels themselves or had bought the property with them. The survey format is shown in Appendix 9.17.

Households were identified through the Oxford Solar Map¹², and by ad hoc visual surveys. Figure 2 shows the locations of known solar installations in Oxford, indicated by red dots. The locations of households surveyed for this study are marked with red ticks.

Surveys were conducted by cold calling households between 12:00 and 18:30 between 23rd July and 2nd August 2010 and, as an incentive, respondents were offered entry into a prize draw for a £30 Marks and Spencer voucher.

Where householders were not in or unavailable a paper copy of the survey was left, 7% of these were returned by post. Completed surveys represent about 33% of the known solar energy installations in Oxford.

12 The Oxford Solar map was part of an initiative to promote domestic solar energy by providing information to residents about the technologies and existing installations in Oxford City [Oxford Solar Initiative, 2006, Oxford City Council, 2010].

Table 3 : Survey Completion Rates

Total number of known installations in Oxford	Total number of installations visited	% installations visited
87	62	71%
Total number of verbal surveys initiated	Total number of verbal surveys completed	Completion rate
22	22	100%
Total number of surveys distributed for self completion	Total number of self-completed surveys returned	Completion rate
40	7	18%
Total number of surveys completed	Aggregate response rate	% known installations surveyed
29	47%	33%

3.5. Summary

The study gathered data from 3 different sources in order to achieve a multi faceted perspective on solar energy and value in Oxford.

Sample sizes, response rates and proportions of the total target market are summarised in the table below.

Table 4 : Summary of data collected, by method, response rate and % of total

Method	Target market	Sample size	Response rate	Size of target market	% of target market
Questionnaires	Potential property buyers	30	4%	60,000 (households)	0.05%
Interviews	Estate agents	6	75%	56	11%
Survey	Households with of solar installations	29	47%	87	33%

3.6. Limitations

The limitations of these methods are summarised below;

Oxford's demographic make up is distinctive and therefore it is important to ensure that results are framed in this context and the generalisation of conclusions is avoided.

The professional experience of the author risks affecting the results of the study, as their role at Oxford City Council is to promote energy saving and renewable energy initiatives. Awareness of this risk this was used to manage it but it is impossible to eliminate it entirely.

Questionnaires can only identify consciously formed 'intentions' and cannot be deemed to accurately reflect actions, either present or future (Sayce et al, 2010). In this sense relative data from questionnaires can be deemed more reliable than absolute data.

For simplicity only one solar panel of each type was displayed in questionnaires. An evacuated tube solar thermal panel was chosen because of its difference in appearance to a solar photovoltaic panel¹³. The limited format of the questionnaire prevents the study from exploring householder's reactions to panels with different appearances and in situ.

Sample sizes of 30 and less limit the reliability of the data and make statistical significance amongst the results less likely.

Interview and survey responses will be influenced by the personal opinion of the interviewee and may be linked to their familiarity with the technology, their identification with 'green' issues or political standpoint.

There is also potential for self-selection on the part of estate agents and questionnaire respondents. For this reason the full estate agent contact log is shown in Appendix 9.9. This log appears to indicate that the most common reasons agencies declined to participate was lack of time¹⁴.

As the estate agents were interviewed in their professional capacity, this may have encouraged them to overstate their level of knowledge and the level of confidence in their responses.

Interpretation and transcription of interviews and surveys may be unconsciously influenced by the personal opinion of the interviewer/author. There may also be accidental errors in either the interpretation or transcription of responses.

13 For this reason any aesthetic opinions expressed towards the PV panel could also be seen as being applied to a solar flat plate panel.

14 The log marks those who stated lack of time as a reason for non-participation as NT and those who stated lack of interest as NI.

4. RESULTS

The responses to the questionnaires, interviews and surveys were in-putted into a spreadsheet in order to aid analysis and facilitate charting of data.

Chart titles indicate the number of responses (n) and y-axes show the percentage response.

Bar charts have been chosen to portray absolute figures and in order to analyse distributions and statistical significance. Pie charts have been used to visually demonstrate the relative frequencies of responses.

Results have been tested at a 5% significance level and therefore error lines show the 95% confidence level¹⁵

4.1. Property Buyer Questionnaire

Charts 1 – 11 below show the responses collected to Questions 1-11 of the Prospective Property Buyer Questionnaire (Appendix 9.2).

Charts 22-28 in Appendix 9.10 show the demographic information collected by the section of the Questionnaire entitled “About you”. These are discussed in more detail in the Analysis section, 5.1.

Responses

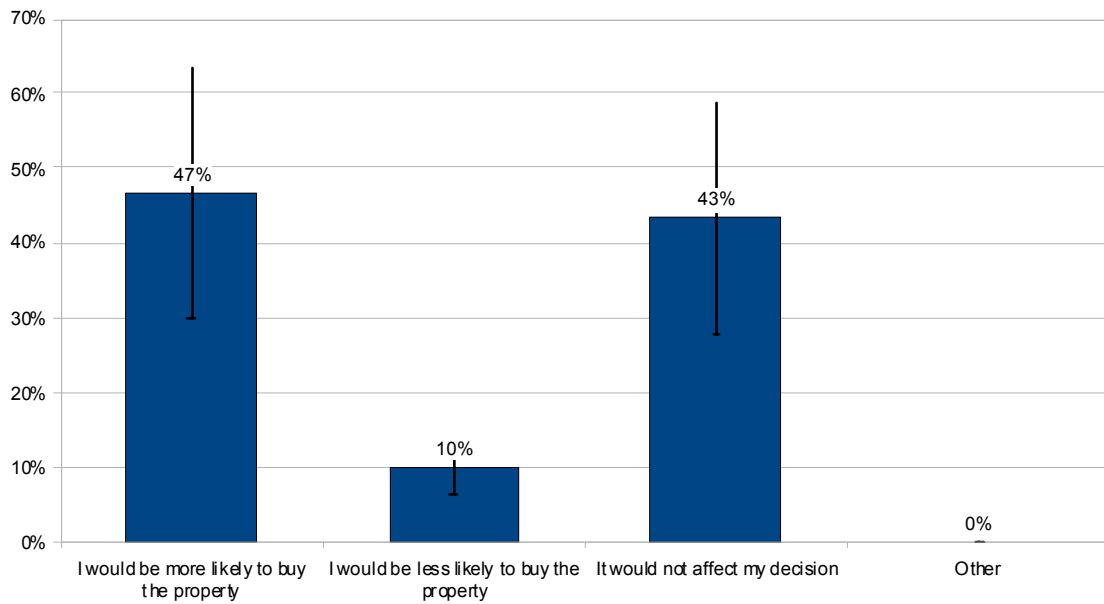
1. **Would visible solar hot water panels, like those on the right, affect your decision to buy a property?** Please underline the statement that most applies.



- a) I would be more likely to buy the property (go to question 2)
- b) I would be less likely to buy the property (go to question 5)
- c) It wouldn't affect my decision (go to question 6)
- d) Other

¹⁵ A 95% confidence interval is calculated as 1.96 standard deviations away from the mean divided by the square root of the number in the data set.

Chart 1: Responses to Q1: Would visible solar hot water panels, like those on the right, affect your decision to buy a property? (n = 30)



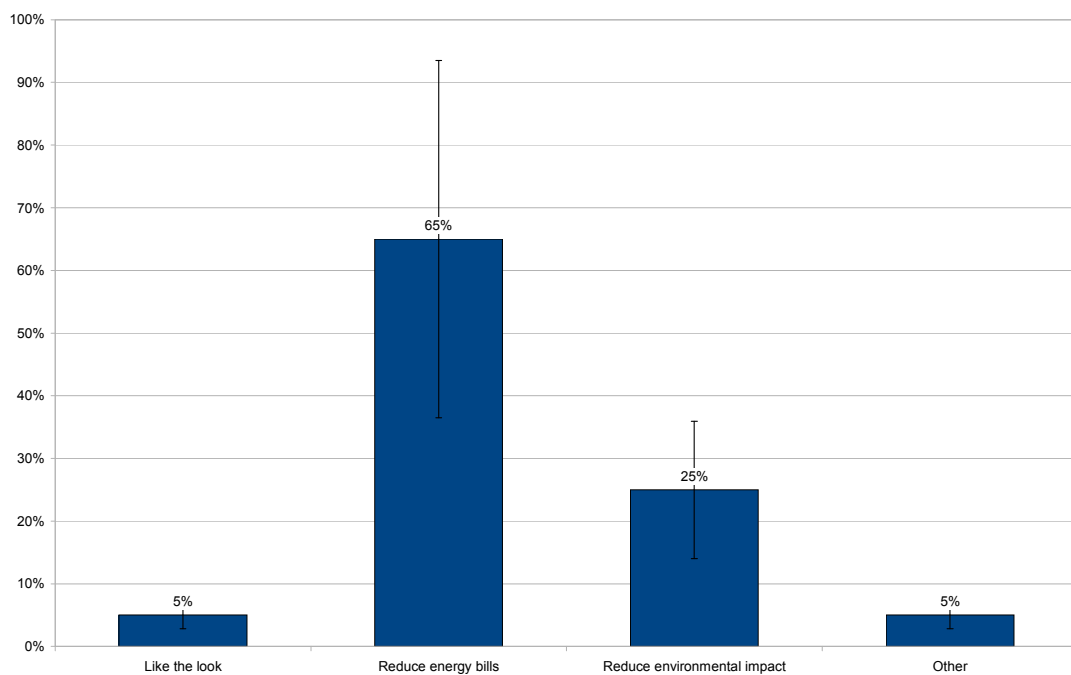
Summary: 47% of respondents said they would be more likely to buy a property with visible solar thermal panels, 10% said they would be less likely to buy it and 43% said it would not affect their decision. The results can be considered statistically significant¹⁶.

16 the expected mean value of a random sample (25%) falls outside the confidence intervals

2. **What is the main reason you would be more likely to buy a property with solar hot water panels?** Please underline the statement that most applies.

- a) I like the look of them
- b) They would reduce the property's energy bills
- c) They would reduce the property's environmental impact
- d) Other

Chart 2: Responses to Q2: What is the main reason you would be more likely to buy a property with solar hot water panels? (n = 20)



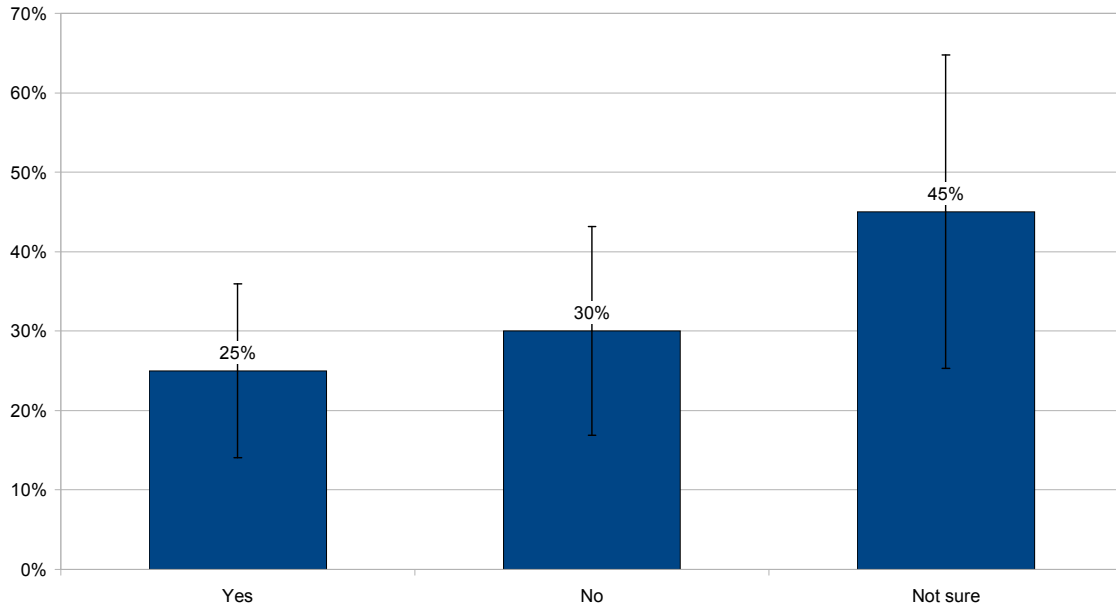
Summary: Of those who said they would be more likely to buy a property with visible solar thermal panels 5% said it was because they liked the look of them, 65% said it was because panels would reduce the property's energy bills, 25% because they would reduce the property's environmental impact and 5% said it was for other reasons. The results can be considered statistically significant¹⁷.

17 the expected mean value of a random sample (25%) falls outside the confidence intervals

3. Would you be prepared to pay more for a property with solar hot water panels?

- a) Yes (go to question 4)
- b) No (go to question 6)
- c) Not sure (go to question 6)

Chart 3: Responses to Q3: What is the main reason you would be more likely to buy a property with solar hot water panels? (n = 20)



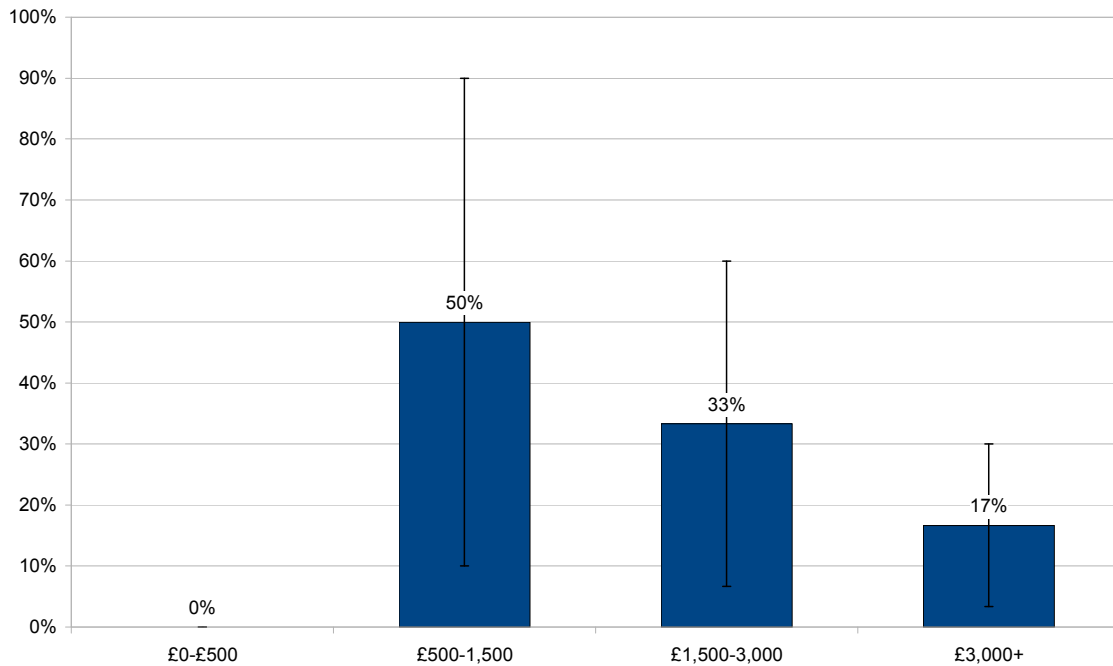
Summary: Of those who said they would be more likely to buy a property with visible solar thermal panels 25% said they would pay more for the property, 30% said they would not pay more, 45% were not sure. The results cannot be considered statistically significant¹⁸.

¹⁸ the expected mean value of a random sample (33%) falls inside the confidence intervals.

4. How much more would you be prepared to pay for a property with solar hot water panels:

Less than £500 £500 - 1,500 £1,500 – 3,000 £3,000+

Chart 4: Responses to Q4: How much more would you be prepared to pay for a property with solar hot water panels: (n = 6)



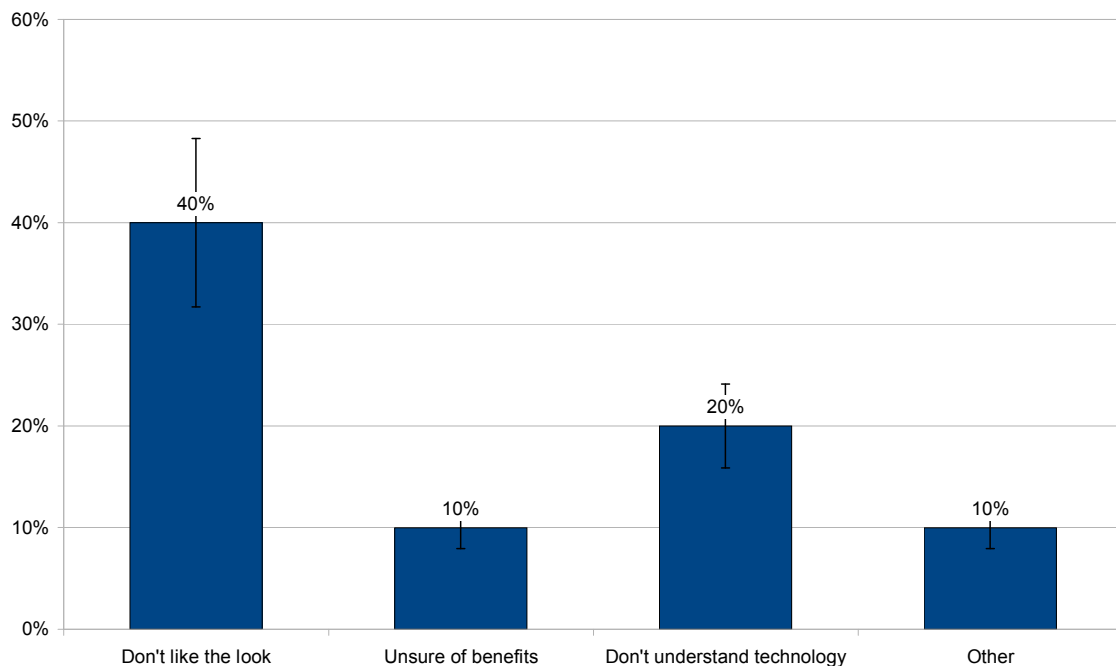
Summary: Of all those who would pay more for a property with solar thermal panels 50% would pay £500-£1,000, 33% would pay £1,500-£3,000 and 17% would pay over £3,000. The results cannot be considered statistically significant¹⁹.

19 the expected mean value of a random sample (25%) falls inside the confidence intervals.

5. **What is the main reason you would be less likely to buy a property with solar hot water panels?** Please underline the statement that most applies

- a) I don't like the look of them
- b) I'm not sure what the benefits would be
- c) I don't understand the technology
- d) Other

Chart 5: Responses to Q5: What is the main reason you would be less likely to buy a property with solar hot water panels? (n = 10)



Summary: Of those who said they would be less likely to buy a property with visible solar thermal panels 40% said it was because they did not like the look of them, 10% said it was because they were not sure what the benefits would be, 20% said it was because they did not understand the technology and 10% said it was for other reasons, e.g. “More to up keep”. The results can be considered statistically significant²⁰.

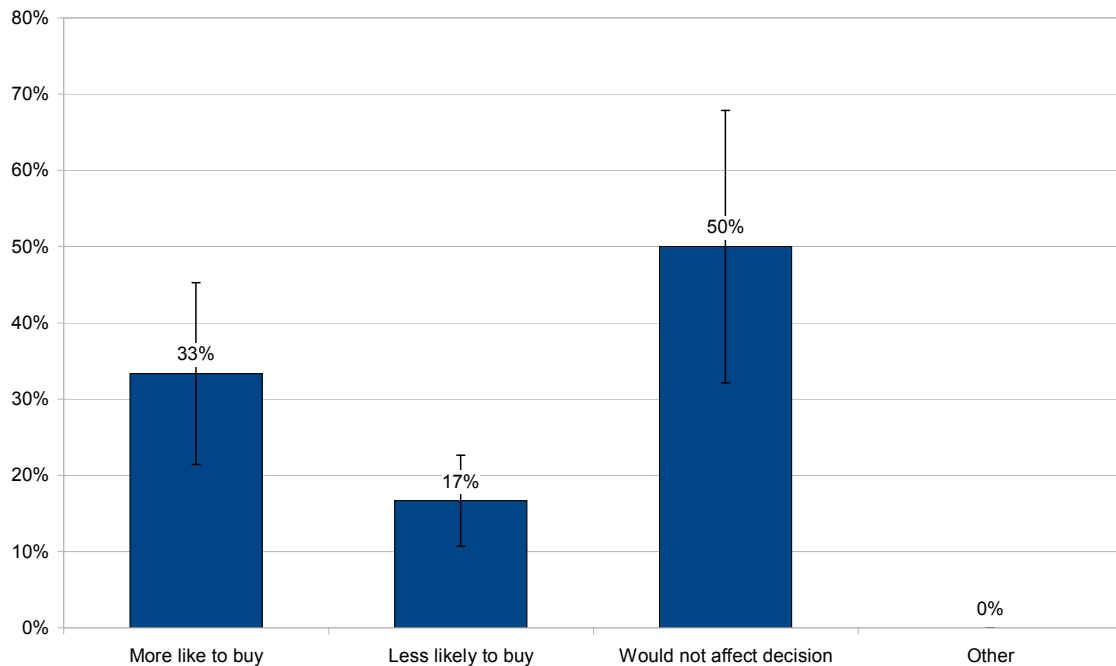
20 the expected mean value of a random sample (25%) falls outside the confidence intervals

6. **Would visible solar electricity panels, like those on the right, affect your decision to buy a property?** Please underline the statement that most applies.



- a) I would be more likely to buy the property (go to question 7)
- b) I would be less likely to buy the property (go to question 10)
- c) It wouldn't affect my decision (go to question 11)
- d) Other

Chart 6: Responses to Q6: Would visible solar electricity panels, like those on the right, affect your decision to buy a property? (n = 30)



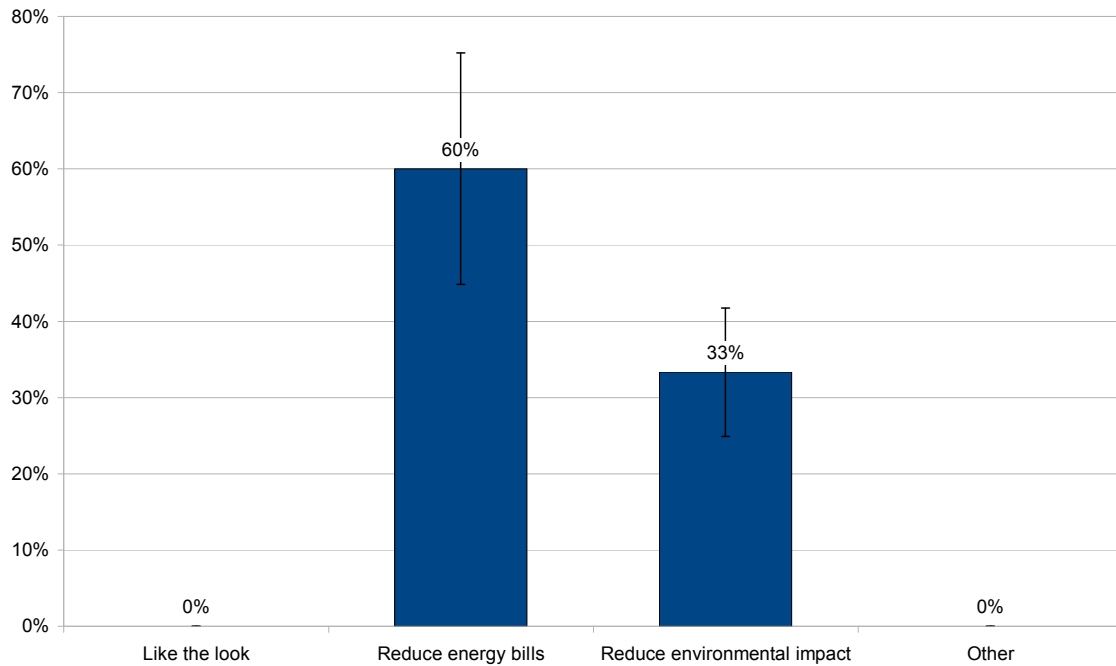
Summary: 33% of responses said they would be more likely to buy a property with visible solar photovoltaic panels, 17% said they would be less likely to buy a property with visible solar panels, 50% said it would not affect their decision. The results might be statistically significant²¹

21 as the expected mean value of a random sample (25%) falls outside most confidence intervals

7. **What is the main reason you would more likely to buy a property with solar electricity panels?** Please underline the statement that most applies.

- a) I like the look of them
- b) They would reduce the property's energy bills
- c) They would reduce the property's environmental impact
- d) Other

Chart 7: Responses to Q7: What is the main reason you would more likely to buy a property with solar electricity panels? (n = 15)



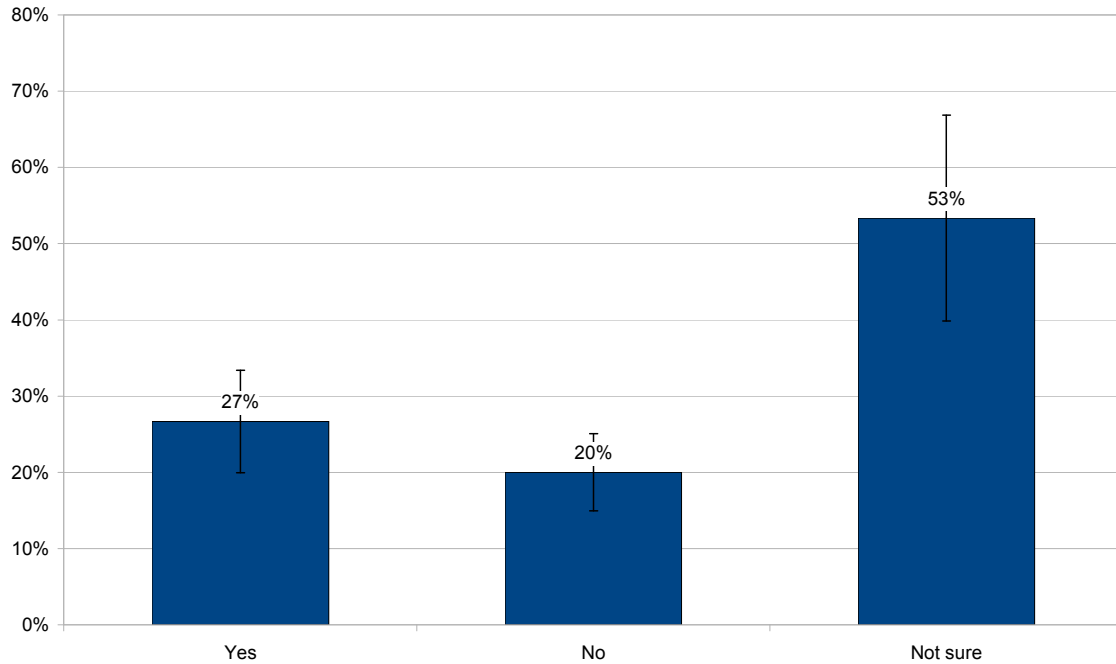
Summary: Of those who said they would be more likely to buy a property with visible solar photovoltaic panels none said it was because they liked the look of them, 60% said it was because they would reduce the property's energy bills, 33% said it was because they would reduce the property's environmental impact. The results can be considered statistically significant²².

22 the expected mean value of a random sample (25%) falls outside the confidence intervals

8. Would you be prepared to pay more for a property with visible solar electricity panels?

- a) Yes (go to question 9)
- b) No (go to question 11)
- c) Not sure (go to question 11)

Chart 8: Responses to Q8: What is the main reason you would more likely to buy a property with solar electricity panels? (n = 15)



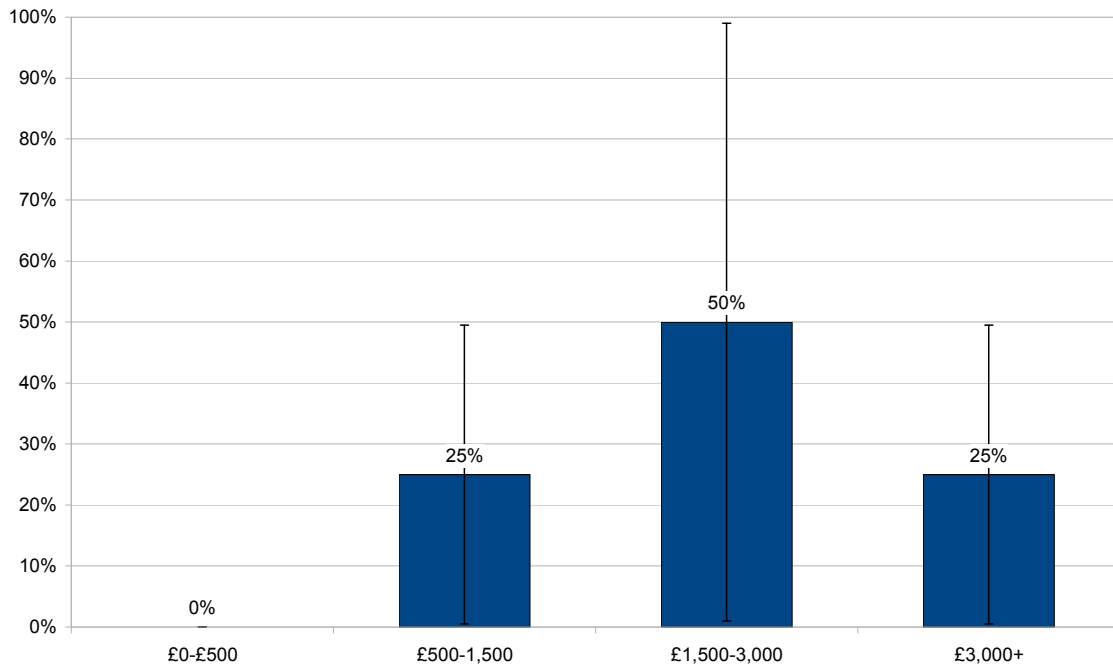
Summary: Of those who said they would be more likely to buy a property with visible solar photovoltaic panels 27% said they would pay more for the property, 20% said they would not pay more, 53% were not sure. The results can be considered statistically significant²³.

23 the expected mean value of a random sample (33%) falls outside the confidence intervals

9. How much more would you be prepared to pay for a house with solar electricity panels:

Less than £500 £500 - 1,500 £1,500 – 3,000 £3,000+

Chart 9: Responses to Q9: How much more would you be prepared to pay for a house with solar electricity panels: (n = 4)



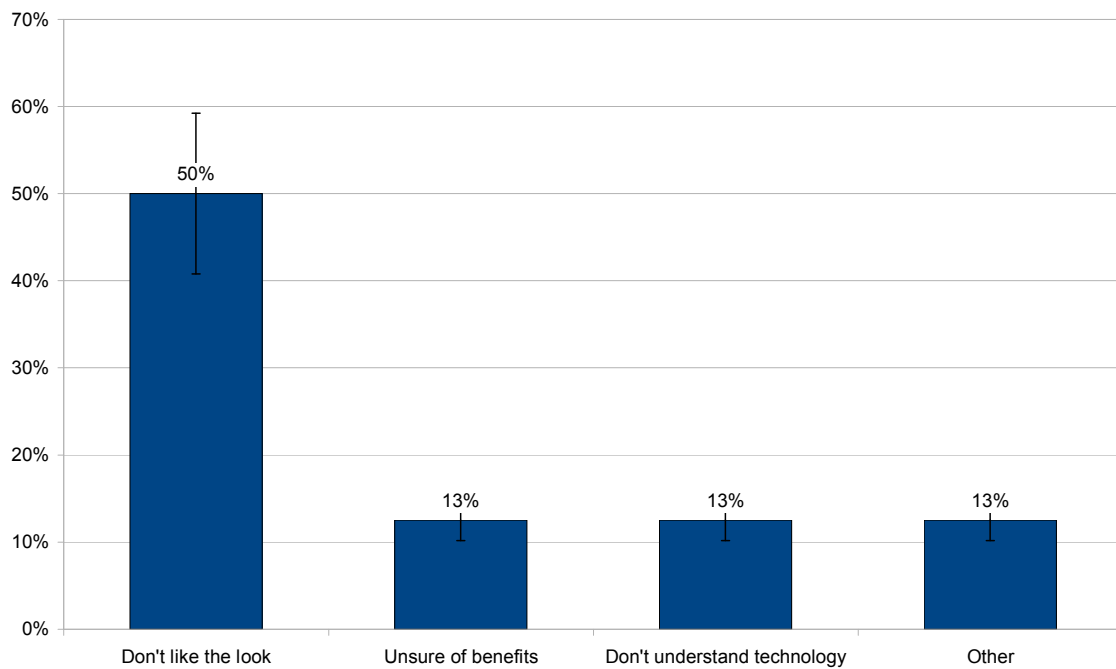
Summary: Of all those who would pay more for a property with solar photovoltaic panels none would pay £500-£1,000, 25% would pay £500 – £1,500, 50% would pay £1,500-£3,000 and 25% would pay over £3,000. The results cannot be considered statistically significant²⁴.

24 the expected mean value of a random sample (25%) falls inside the confidence intervals

10. What is the main reason you would you pay less for a property with solar electricity panels? Please underline the statement that most applies

- a) I don't like the look of them
- b) I'm not sure what the benefits would be
- c) I don't understand the technology
- d) Other

Chart 10: Responses to Q10: What is the main reason you would you pay less for a property with solar electricity panels? (n = 8)



Summary: Of those who said they would be less likely to buy a property with visible solar photovoltaic panels 50% said it was because they did not like the look of them, 13% said it was because they were not sure what the benefits would be, 13% said it was because they did not understand the technology and 13% said it was for other reasons, e.g. “will cost to up keep”.

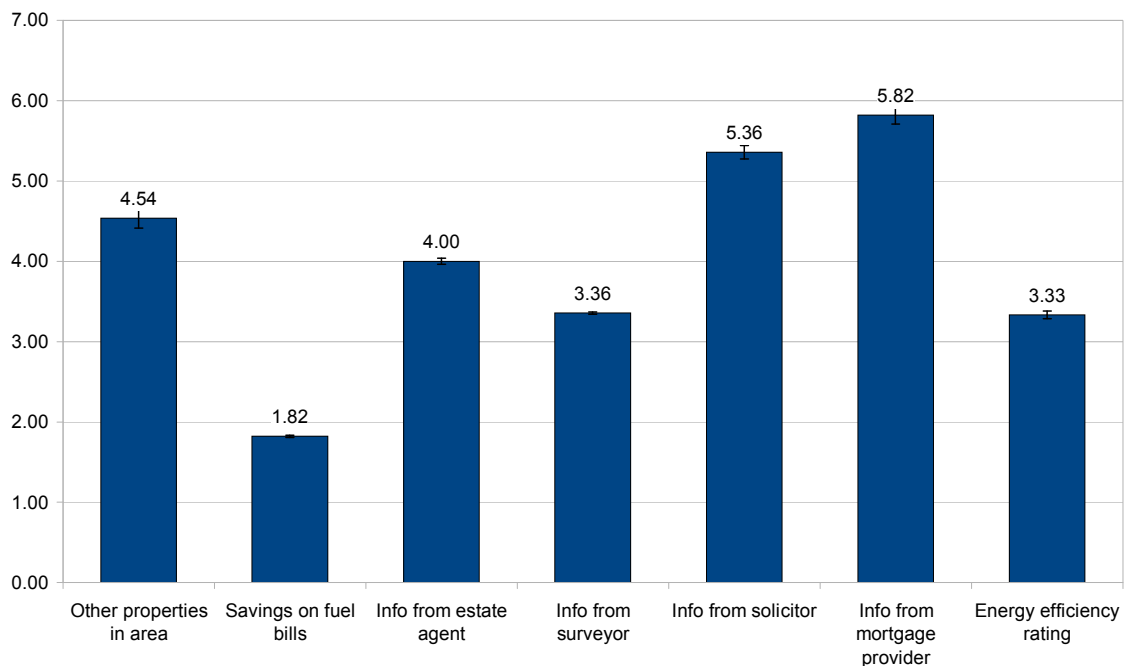
The results can be considered statistically significant²⁵

25 the expected mean value of a random sample (25%) falls outside the confidence intervals

11. Please rank the following in order of the influence they would have on your purchase decision on properties with solar panels? 1= Greatest influence, 7= Least Influence

- a) You know other properties in the area have solar panels
- b) You are given information about savings on fuel bills
- c) You are given information about the technology from your estate agent
- d) You are given information about the technology from your surveyor
- e) You are given information about the technology from your solicitor
- f) You are given information about the technology from your mortgage provider
- g) You are told the properties' Energy Efficiency Rating (A to G)

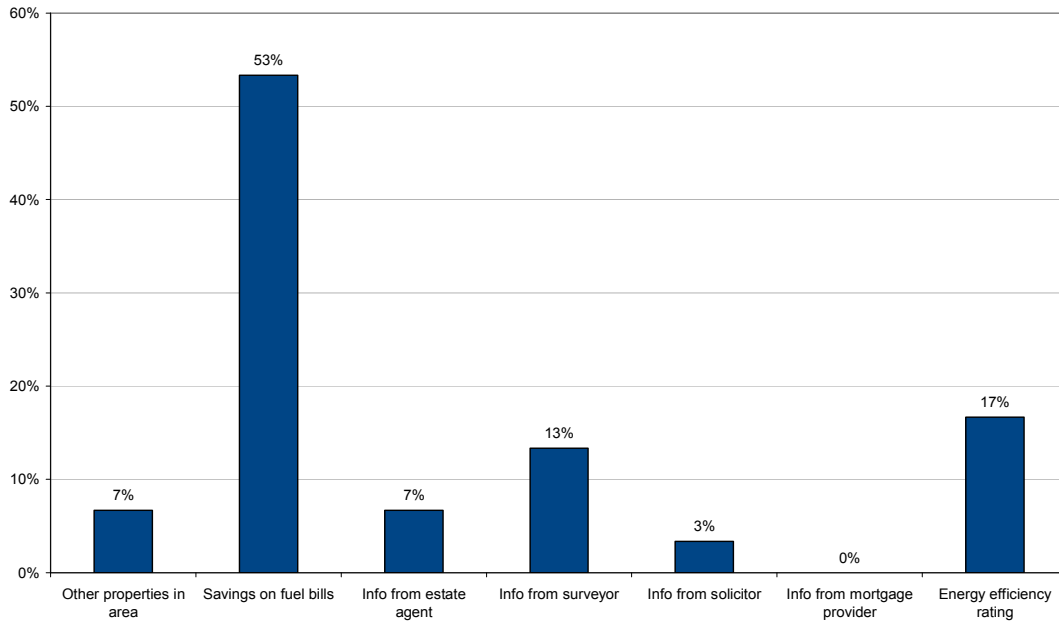
Chart 11: Responses to Q11: Please rank the following in order of the influence they would have on your purchase decision on properties with solar panels? Average (n = 127)



Summary: Information about savings on fuel bills was ranked as being the most influential on purchase decisions (with an average rank of 1.82), followed by the properties energy efficiency rating (3.83), information from their surveyor (3.36), information from their estate agent (4.0), knowing other properties in the area had solar panels (4.54) and information from their solicitor (5.36). Information from their mortgage provider was ranked as the least influential (5.82). The results can be considered statistically significant²⁶

26 the expected mean value of a random sample (4.0) falls outside the confidence intervals

Chart 11a: Please rank the following in order of the influence they would have on your purchase decision on properties with solar panels: Greatest influence (n = 30)



Summary: 53% of prospective buyers ranked savings on fuel bills as the greatest influence on their purchase decision. 17% rated the greatest influence as the property’s energy efficiency rating, 13% rated it as information from their surveyor, 7% each rated it as information from their estate agent and knowing other properties in the area have solar panels, 3% rated it as information from their solicitor and 0% as information from their mortgage provider.

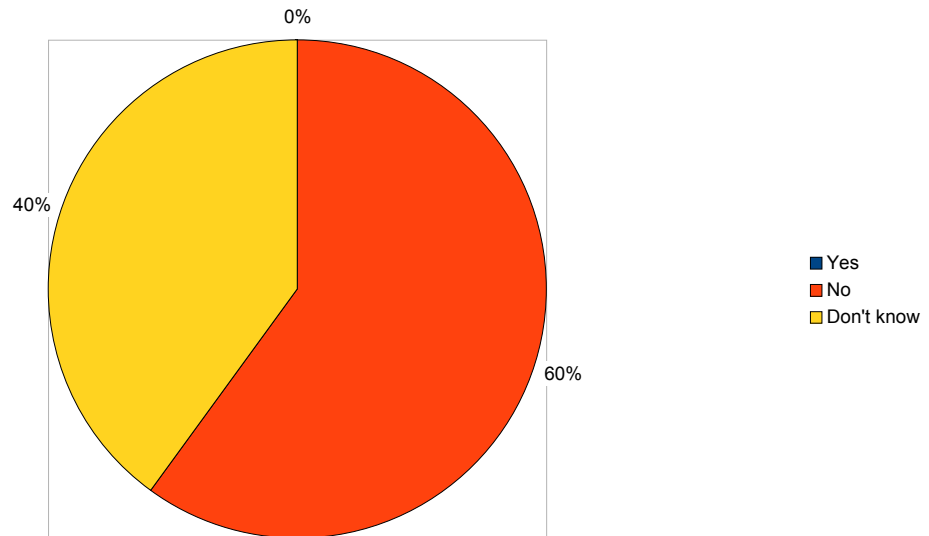
4.2. Estate Agent Interviews

Responses to questions collecting discreet information were entered into a spreadsheet to enable charting of the responses. A summary of responses is shown in Charts 12- 17 below²⁷. Information about properties marketed or sold with solar panels is contained in Appendix 9.11.

27 Where the number of responses (n) is less than the total number of interviewees (6), interviewees either weren't asked questions or the answer given was not relevant, see interview transcripts; Appendix 9.4

“Do you think there is any demand for properties with solar panels?”

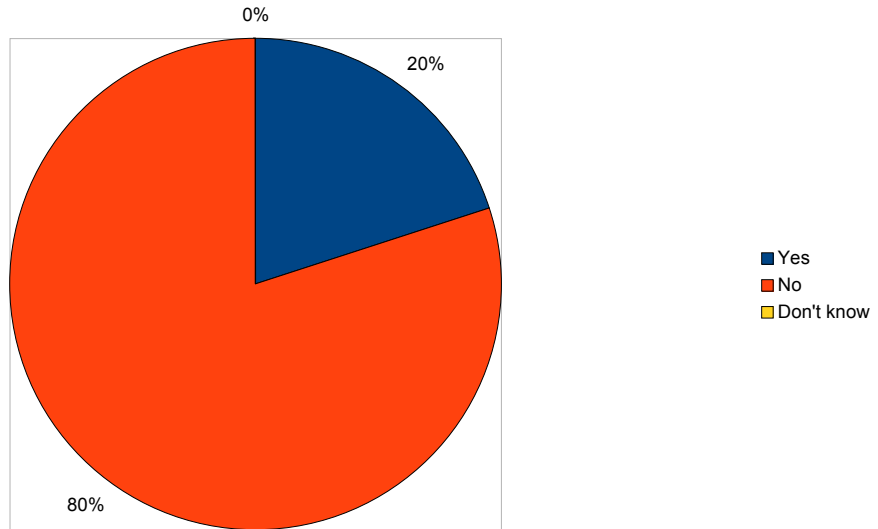
Chart 12: Do you think there is any demand for properties with solar panels?, interviewed Estate Agents (n=5)



60% of interviewed estate agents believed there was no demand for properties with solar panels, 40% said they did not know

“Would solar panels affect your valuation of a property?”

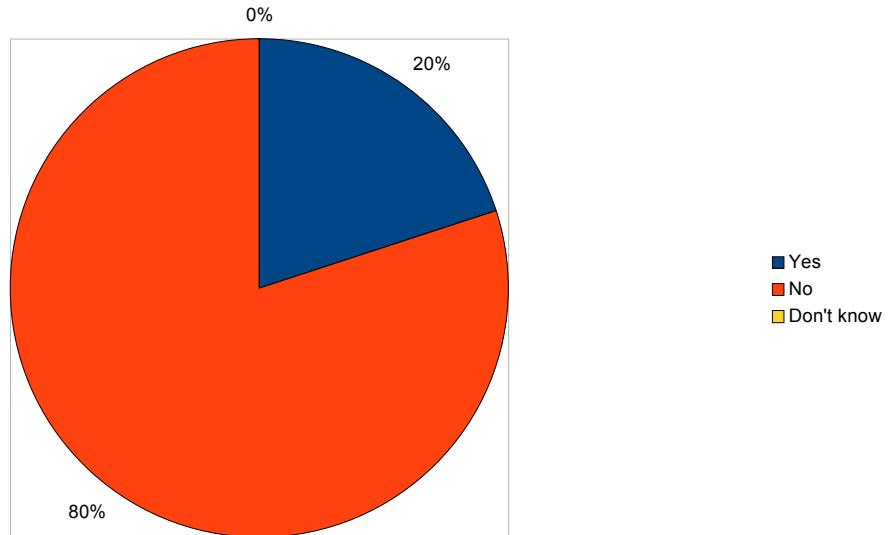
Chart 13: Would solar panels affect your valuation of a property?, interviewed Estate Agent s (n=5)



80% of interviewed estate agents said the presence of solar panels would not affect their valuation of a property, 20% said that they would.

“Would an A or G rated EPC affect your valuation of a property?”

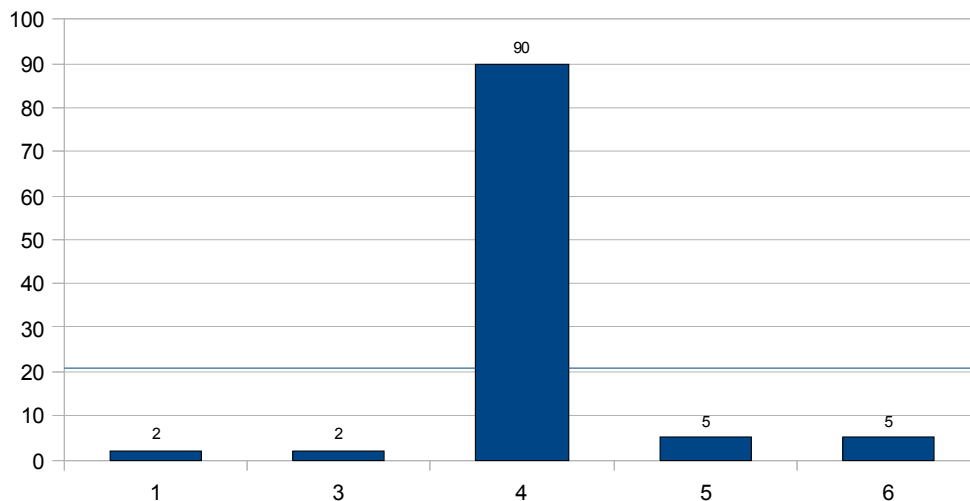
Chart 14: Would an A or G rated EPC affect your valuation of a property?, interviewed Estate Agents (n=5)



80% of interviewed estate agents said an A or G rated EPC would not affect their valuation of a property, 20% said it would.

“How often are you asked about the energy efficiency of a property?”

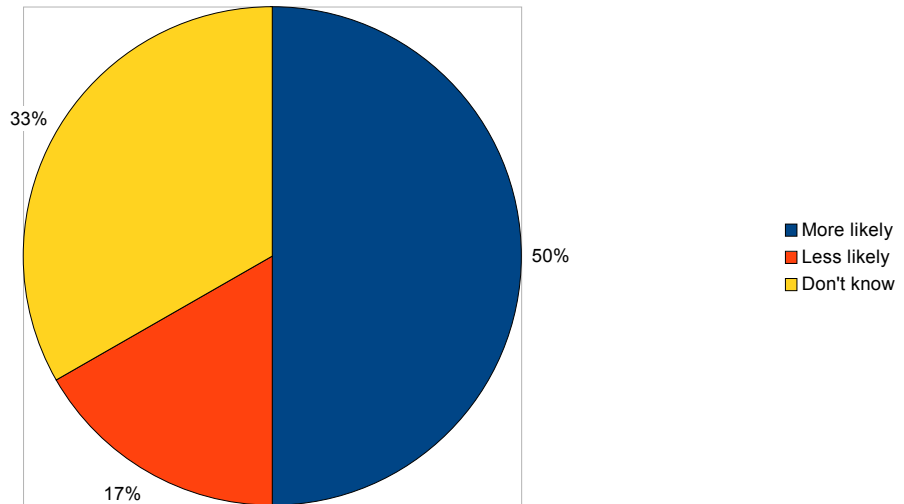
Chart 15: How often are you asked about the energy efficiency of a property, as % of the time, by Estate Agent Interview Reference No.



Four out of five estate agents interviewed were asked about energy efficiency 2-5% of the time, one was asked 90% of the time.

“In a like-for-like situation, do you think your customers would be more or less likely to buy a property with solar panels?”

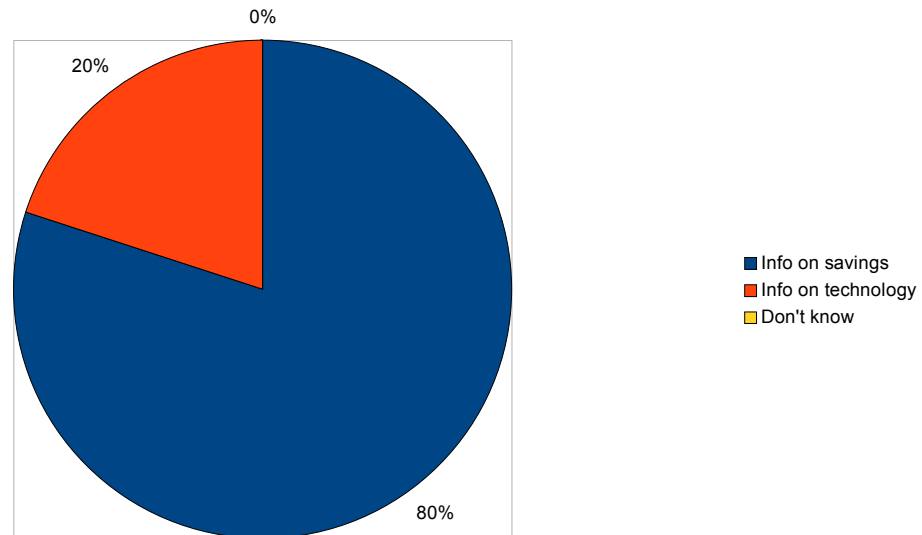
Chart 16: Do you think your customers would be more or less likely to buy a property with solar panels?, interviewed Estate Agents (n=6)



50% of estate agents interviewed thought their clients would be more likely to buy a property with solar panels, 17% thought their clients would be less likely to buy a property with solar and 33% did not know.

“What do you think would influence their decision?”

Chart 17: What do you think would influence their decision? interviewed Estate Agents (n=5)



80% of estate agents thought information on savings would influence the purchase decisions of clients on properties with solar, 20% thought information of technology would influence purchase decisions.

4.3. Householder Surveys

The responses to householder surveys were inputted into a spreadsheet to aid analysis and facilitate charting, see extract in Appendix 9.13.

The results are presented in Charts 18 – 23 below and detailed responses are cross-referenced by number.

[If owner] Did [the property] have solar panels when you bought it?

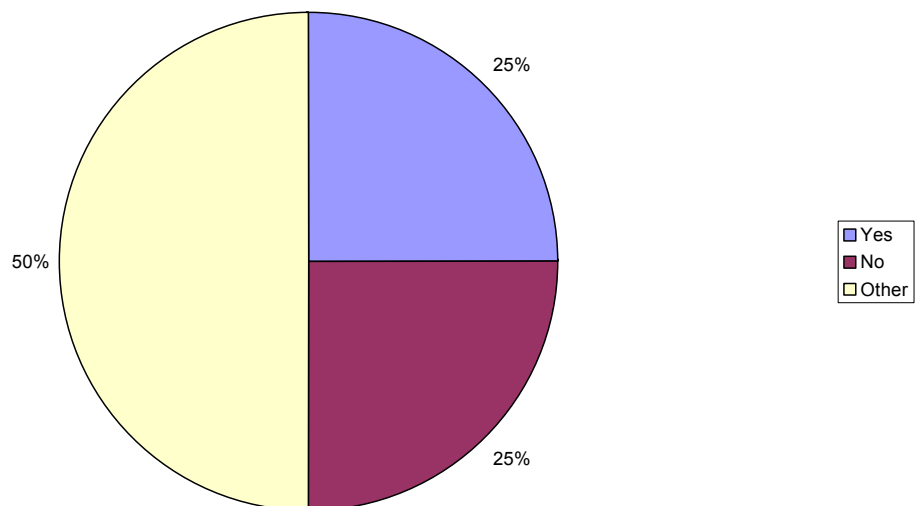
Chart 18: Did [the property] have solar panels when you bought it? (n=22)



Of home owners, 85% of those surveyed had installed solar panels, 15% had bought the property with solar panels.

[If yes] Did they affect your decision to buy the property?

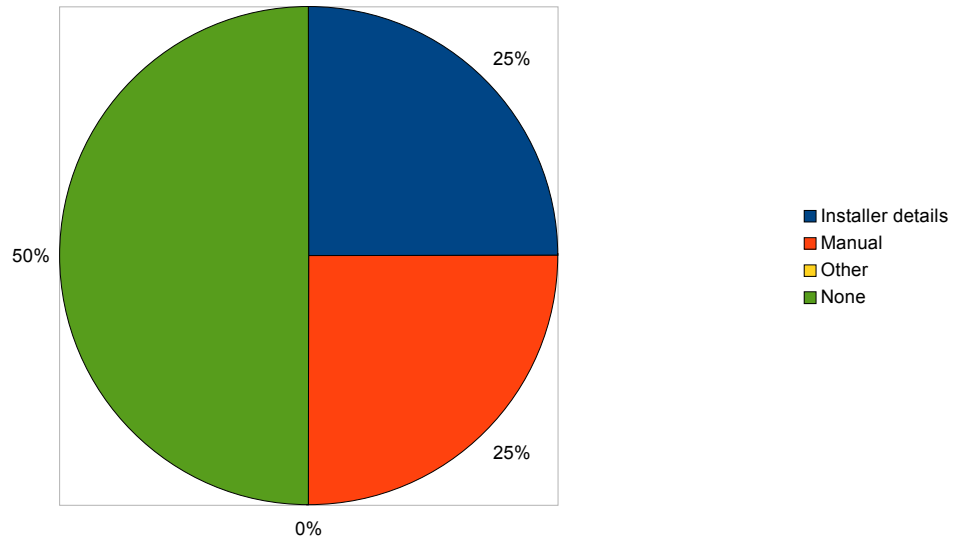
Chart 19: Did solar panels affect your decision to buy the property?, householders surveyed (n=4)



Of those who had bought properties with solar panels, 25% said it had not affected their decision, 25% said it had and 50% gave another answer e.g. "I inherited the property" [72]

[If bought property with solar panels] What information was given to you about them at the time?

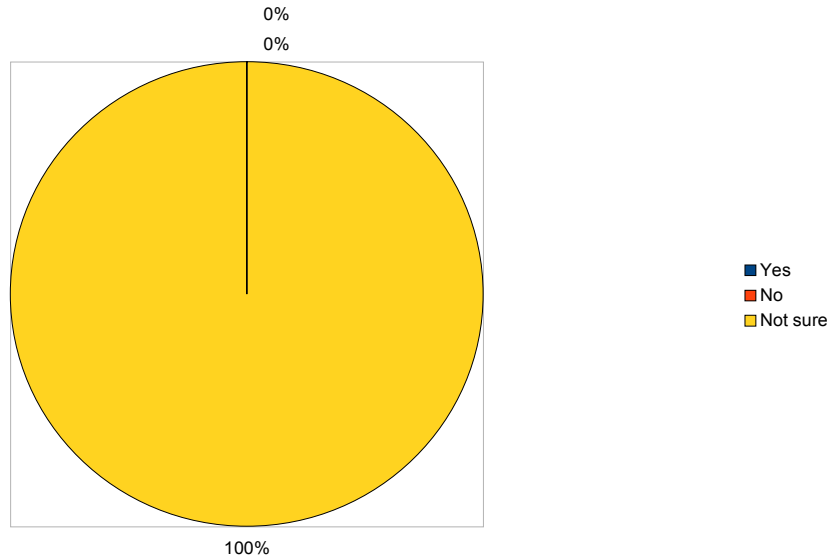
Chart 20: What information was given to you about the solar panels when you bought the property, householders surveyed (n=4)



25% of householders who bought properties with solar panels were given the installer's details, 25% were given a manual and 50% were given no information.

[If bought property with solar panels] Do you think they will increase the value of the property?

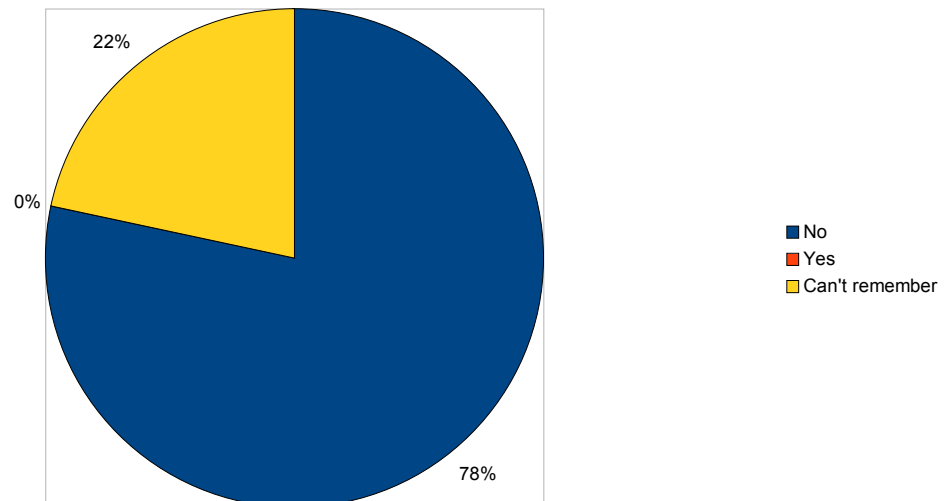
Chart 21: Do you think they will increase the value of the property, householders surveyed (n=2)



100% of people who had bought properties with solar panels did not know whether they would add value to the property.

[If installed panels] Were you given any information about the value it might add to the property at the time?

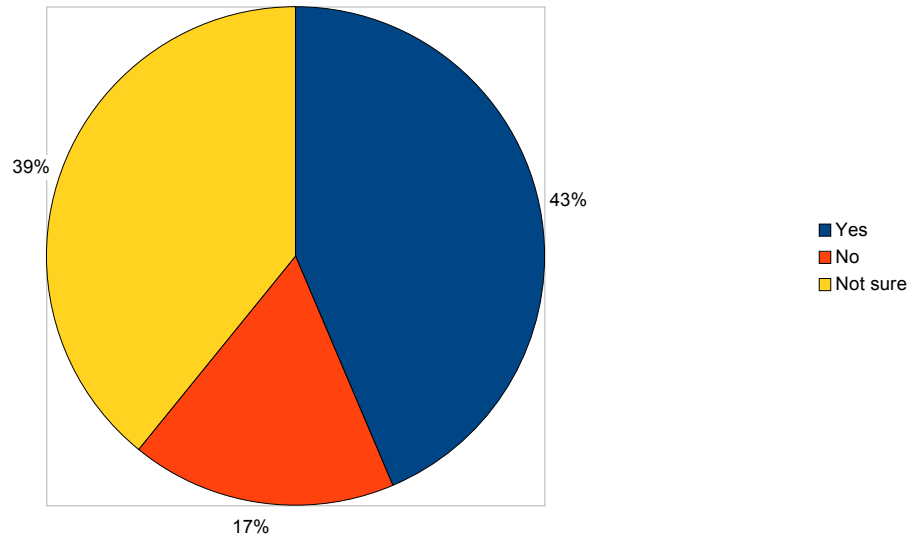
Chart 22: Were you given any information about the value solar might add to the property at the time?, householders surveyed (n=18)



78% of those who installed solar panels were not given any information at the time about the value it would add to the property and 22% could not remember being given any information.

[If installed solar panels] Do you think they will increase the value of the property?

Chart 23: Do you think they will increase the value of the property, householders surveyed (n=18)



Of those who installed solar panels 43% thought they would increase the value of their property, 17% thought they would not increase the value and 39% were not sure.

5. ANALYSIS

The analysis below uses data from the previous section to inform the research question of “Do installations of solar thermal or solar photovoltaic affect house prices of saleability in Oxford” by looking at the evidence for each of the following elements:

- Saleability of properties with solar panels
- Value of properties with solar panels
- Influential factors

The analysis covers the property buyer’s questionnaire, estate agents interviews and householders surveys in turn. The initial part of each section considers whether the sample can be considered representative.

Overall conclusions are presented in the next section.

5.1. Property Buyer's Questionnaire

Broadly responses to the questionnaire are assumed to be fairly representative of the house buying demographic in Oxford. However number of responses by size of property sought shows a bimodal distribution. This may indicate that, from this perspective, it is an unrepresentative sample. A detailed discussion of the demographic make up of questionnaire respondents is contained in Appendix 9.14.

5.1.1. Saleability of Properties with Solar Panels

Based on prospective property buyer’s responses, there is some evidence that solar panels increase the saleability of properties, particularly solar thermal panels: responses to Q1 and Q6 show that proportionally those more likely to buy properties with solar exceed those less likely to buy them.

The difference between those more likely to buy and less likely to buy a property with solar is 37% for solar thermal and 17% for solar PV.²⁸ This implies that, on aggregate, between one sixth and one third of householders would be more likely to buy a property with solar panels in a like-for-like situation, depending on the type of panels.

However a significant proportion of respondents²⁹ said the panels would not affect their decision. This suggests market signals from those with a

28 47% of respondents said they would be more likely to buy a property with visible solar thermal panels and 33% would be more likely to buy a property with visible solar photovoltaic panels, whereas only 10% of responses said they would be less likely to buy a property with visible solar thermal panels and 17% less likely to buy a property with PV) The responses to these questions can be considered statistically significant. [Charts 1 + 6]

29 43% for solar thermal and 50% for solar PV

preference for solar panels are likely to be diluted by those who are ambivalent towards them, and therefore signs of increased saleability are likely to be marginal.

Householders were more ambivalent towards solar photovoltaic panels, suggesting that the benefits, e.g. the fuel savings, of this technology are less well known³⁰.

The questionnaires indicate that the savings on fuel bills are the key selling point for properties with solar panels³¹ followed by reducing the environmental impact of the property³².

Those who were less likely to buy properties with solar panels generally did not like the look of them, though overall these people represented a small proportion of all respondents³³. Very few respondents said they would be less likely to buy property with solar because they didn't understand the technology or the benefits³⁴.

The results suggest a slight aesthetic preference for the evacuated tube panels over the PV panels shown³⁵.

A rudimentary statistical analysis in Appendix 9.7 tentatively suggests some level of correlation between preferences for solar and type of property sought and little correlation between a preference for solar and respondent age, property size or price range³⁶.

Answers to Q1 were plotted by gender and the result seems to indicate that women were more likely to buy properties with solar thermal panels than men, see Appendix 9.8. However it is beyond the scope of this study to explore the strength or implications of this or other correlations in depth.

30 This may derive from the more widespread use of solar thermal or the more straightforward nature of solar thermal technology.

31 Most people who preferred properties with solar panels stated they did so because of reduced in energy bills, 65% for thermal and 60% for PV. These respondents represent 43% of the total for solar thermal and 30% of the total for solar PV.

32 17% of all respondents would be more likely to buy a property with solar panels (PV or thermal) because of they would reduce the environmental impact of the property [Charts 2 + 7].

33 13% of all respondents did not like the look of solar thermal and 13% did not like the look of solar PV

34 7% of all respondents did not understand solar thermal technology and 3% did not understand solar PV technology and 3%, for each type, did not understand the benefits

35 5% of those who would be more likely to buy properties with solar thermal liked the look of them, versus 0% for solar PV plus 50% of those who would be less likely to buy properties with PV did not like the look of them versus 33% for solar thermal [Charts 5,6,7 +10]

36 Correlation between preference for solar (either type) and age: <-0.25 ($r^2 <-0.20$), property size <-0.15 ($r^2 <-0.1$), price range ≤ -0.25 ($r^2 <-0.1$), property type >0.3 ($r^2 >0.3$)

5.1.2. Value of Properties with Solar Panels

Based on responses to the questionnaire there is little evidence that solar panels affect house prices; only 25% of those who preferred properties with solar thermal panels³⁷ and 27% of those who preferred properties with solar photovoltaic panels³⁸ were willing to pay more for them.

Those willing to pay more for a property with solar panels would pay on average £1,708 more for a property with solar thermal, and £1,938 more for a property with solar PV³⁹.

It is possible to arrive at a figure for “average extra paid”, by multiplying the average extra paid by the proportion of the total respondents willing to pay extra which suggests an added value of £285 for solar thermal and £258 for solar PV⁴⁰.

This result cannot be considered robust however as it is based on a small number of responses and involves assuming that those who are more likely to buy a property with solar panels, but unsure of whether they would pay more for it⁴¹, would not pay more and those who would be less likely to buy a property with solar panels⁴² would not pay less.

5.1.3. Influential Factors

Based on the responses the most influential factor in purchase decisions on properties with solar panels is information about savings on fuel bills, with 53% of respondents ranking this as the factor that would have the greatest influence on their purchase decision⁴³.

Next most influential is knowledge of the property's energy efficiency rating⁴⁴, information from surveyors⁴⁵ and estate agents⁴⁶.

37 representing 17% of all those surveyed [Charts 3,4,8+9]

38 representing 13% of all those surveyed [Charts 3,4,8+9]

39 These amounts are the sum of the product of the percentage who selected price range by the central value of the range.

40 $£1708 \times 17\% = £284.72$ (ST) and $£1938 \times 13\% = £258.33$ (PV)

41 30% of all respondents for solar thermal and 27% for solar PV

42 10% and 17% of all respondents [Chart 11]

43 [Chart 11]

44 17% chose this as most influential [Chart 11a]

45 13% chose this as most influential [Chart 11a]

46 7% chose this as the most influential [Chart 11a]

This supports the assertion that property professionals are “well equipped to assist in raising public ... awareness” (10, RICS, 2010) and also tends to support assertions that EERs and EPCs do influence the purchase decisions of a proportion of householders (EST, 2009, NHER, 2009).

It also implies that the impact of solar panels on the saleability and value of properties is highly linked to the information provided on savings and that most influential channels for this information would be through EPCs and surveyors and, following those, estate agents.

5.2. Interviews

Broadly interviewees can be considered representative of Estate Agents in Oxford. A discussion of the constitution of interviewed agents is contained in Appendix 9.15.

Transcripts of all interviews are contained in Appendix 9.4.

5.2.1. Saleability of Properties with Solar Panels

In general estate agent opinion was that solar panels do not affect the saleability of properties, either positively or negatively, although half thought that their clients might prefer properties with solar, in a like-for like situation⁴⁷.

The majority of agents did not think that there was demand for properties with solar panels⁴⁸. The most common reason given for this was house buyers had a list of features they were looking for, e.g. location, number of bedrooms and

47 50% said they thought their clients would be more likely to buy properties with solar (Chart 16)

48 60% of agents did not think there was demand for properties with solar [Chart 12]

price and that energy features were not included: “Property purchases are driven by need, for example the need for more bedrooms, so size, location and budget are the key factors” [Interview 3].

One agent stated that he thought solar might make properties less saleable amongst his clients: “In some areas, such as Wolvercote, a property with solar panels might be more popular. However many of the properties we sell are large houses and solar panels would not be a big selling point. In fact some people might even turn their noses up at properties with solar panels” [Interview 2]

Agents who had sold properties with solar panels were unanimous in stating that in their opinion it had made no difference to the sale: “It didn't improve the viewing level but didn't deter them either” [Interview 5]

As a group, agents also exhibited considerable uncertainty on the saleability of properties with solar; 40%⁴⁹ were unsure as to whether there was any demand for them and a third were unsure whether their clients would be more or less likely to buy a property with solar in a like-for-like situation⁵⁰.

5.2.2. Value of Properties with Solar Panels

The interviews indicate that estate agents in Oxford do not believe either solar panels or EPCs affect the value of a property.

Only one of the agents said that solar panels would affect their valuation of a property: “We would take it into account, yes it's important to us.” [Interview 4] This perhaps reflects the market positioning of that particular agency as an organisation “concerned about protecting the environment” (Pink & Black, 2010)

The majority however⁵¹ said that solar panels would not affect their valuation: one agent stated “A ‘feature’ [like solar panels] increases saleability but not value” [Interview 1]. Another stated they might add to the value at the demand of the vendor: “We wouldn't add anything to the amount unless vendor said I spent £50k and I want to recoup value” [Interview 5].

Where agents had sold properties with solar 75% had not mentioned the panels on the property's particulars⁵² indicating agents' assumptions that the panels would not make a difference to the sale; as one agent stated “I didn't consciously leave them off the properties information sheet. I just didn't think it

49 40% of agents did not know whether there was demand for properties with solar [Chart 12]

50 33% of agents did not know whether their clients would be more or less likely to buy a property with solar [Chart 16].

51 67% stated that solar panels would not affect their valuation [Chart 13]

52 Chart 35, Appendix 9.11

would add value. With a house of this size [4 bedroom] the savings on the fuel bills will barely be noticeable” [Interview 2].

To some extent this finding supports RICS assertion that a ‘vicious circle’ exists around EE and value (RICS, 2010, 4); agents do not draw attention to solar because they believe it will not add value and therefore buyers do not get the opportunity to express a preference for it.

On Energy Performance Certificates, the great majority of agents said neither an A-rated nor a G-rated EPC would affect their valuation⁵³. The reason given was that agents will value the property when the householder is considering putting it on the market, whereas the EPC will be arranged once the house has been put on the market: “We generally get the EPC after valuation” [Interview 4].

However one agent said it would affect their valuation “in a sense because an A-rating will indicate an excellent property... We will order an EPC as soon as a property is put on the market. If it is a good rating we will draw people’s attention to it” [Interview 1.] In this case, the EPC might affect the selling price, although not the initial asking price.

5.2.3. Influential Factors

Most estate agents thought that information on savings would be an influential factor in the purchases of properties with solar panels⁵⁴.

EPCs and EERs were assumed to have little influence as most agents stated they were only asked about them a small percentage of the time. As one agent stated: “We sell a lot of Victorian properties and they are not very energy efficient. To my knowledge a poor EPC has never been a reason for someone not buying a property” [Interview 5].

There was a large discrepancy between how often estate agents were asked about energy efficiency; one agent stated they were asked about it in 90% of cases, while the rest stated that they were asked 2-5% of the time. This estate agent sold the smallest percentage of properties in Oxford⁵⁵ so it is possible that energy efficiency is of more concern for those buying rural homes.

There was some indication those who asked were often younger, non-British buyers “Often those asking are non-British” [Interview 1], “Younger buyers tend to ask for EPCs more, also Chinese buyers” [Interview 5.]

53 80% said A/G rated EPCs would not affect their valuation [Chart 14]

54 80% of agents thought information on savings would influence a client's purchase decision on a property with solar panels, while 20% thought it would be information on the technology would be influential [Chart 17]

55 Only 10% of properties sold were in Oxford City (Appendix 9.1)

5.3. Householder Surveys

Householders surveyed cannot be considered as representative as the majority of those interviewed were over 55 and over 70% were female. This may have been a consequence of the time when surveys were undertaken or may indicate a wider dynamic amongst households where solar is installed.

A detailed discussion of demographics of the surveyed group can be found in Appendix

All survey responses are shown in Appendix 9.13.

5.3.1. Saleability of properties with solar panels

The responses from the survey indicate that, for some buyers, solar panels are considered an asset to the property, though for the majority they do not affect purchase decisions⁵⁶.

One householder responded: “It was a huge plus to me. I couldn’t believe that the estate agents were so negative about them” [32]. This reinforces the view that value may not be fully reflected by transactional evidence (Sayce et al., 2010, p18)

Another householder stated “We wouldn’t have not bought [panels] but they’re nice to have” [44]⁵⁷ suggesting that panels may increase saleability but not price.

5.3.2. Value of Properties with Solar Panels

Based on the survey responses there is a great deal of uncertainty amongst householders as to whether and how solar panels would affect the value of their properties.

There results also uncovered a discrepancy between the opinions of householders who had installed solar panels and those who had bought properties with solar: 44% of those who had installed solar panels themselves thought that the panels would increase the value of the property

whereas those who had bought a property with solar were all unsure as to whether it would add value or not.

Of who had installed solar panels 39% were unsure as to whether they would add value. Many of those unsure stated the reason was that they thought their panels were old-fashioned [2, 4, 25, and 49]

56 25% said it did affect their decisions, while 50% stated they were not influenced by the presence of solar panels, 25% stated “Other” [Chart 19]

57 These opinions were reflected by the two tenants interviewed; “We wouldn’t have choose to go to the expense ourselves” [37] and “It was just a bonus really” [59]. Both tenants stated it had made no difference in their rental of the property.

17% of those who had installed solar panels thought they would not increase the value of the property, one householder maintained that the panels might decrease the value of the property “Because they’re not at the front of the property, they’re not eligible for Feed in Tariffs and they’re ugly.” [16]

The householder for whom the panels had been a desirable feature stated “The estate agents suggested solar panels detracted from the property” [32].

One householder stated that she had had the property valued and the estate agents had said the panels added £10,000 to the value; “It was valued after installation and agents (Allen & Harris, Connells) said it added £10,000 to the house” [63]. However she stated that her husband installed solar panels for a living and therefore it is reasonable to assume that a conflict of interest exists.

Householders who had installed panels were asked about the initial cost; the average cost of solar thermal installations was £3,580 and for solar photovoltaic £12,150 [Charts 47, 48]

5.3.3. Influential Factors

Half the householders who had bought properties with solar panels were given no information at all about them at the time, while a quarter were given the installer’s details and another quarter a manual.

No householders, either those who had installed panels or those who had bought properties with them, could remember being given any information about any value they might add to the property.

5.4. Limitations

The limitations of the analysis above are summarised below:

- The small sample sizes, particularly of estate agents and householders, mean that a number of findings are based on very small numbers of responses. For this reason all charts show the numbers of those who responded (n) and the analysis takes account of the lack of reliability of conclusions based on such small samples.
- Due also in part to small samples sizes the results cannot be considered wholly representative of the demographics of Oxford
- It is likely that there was some self-selection on the part of both participating estate agents and prospective house buyers, i.e. that those more interested and aware of solar technology responded and therefore the results are therefore positively skewed towards a preference for solar energy.
- Two questions in the householder survey were leading, e.g. “Do you think they will *increase* the value of the property?” and “Were you given any information about the value it might *add* to the property at the time?” These could have been rephrased to make them more neutral

e.g. “Do you think they will *affect* the value of the property?”

- The images of solar panels used in the questionnaire cannot be considered to be representative of all solar thermal or photovoltaic panels. Furthermore panels are likely to look different in situ, or may not be visible at all.

In summary the study would have benefited from larger sample sizes and a greater proportion of one-to-one interviews, in an attempt to reduce self-selection.

This could be achieved through telephone or door-to-door surveys inside and outside working hours in order to achieve more representative samples, by offering a more substantial incentive in order to increase response rates or by extending the time frame of the study to enable more responses to be collected.

Arguably the study could also have been improved by a greater concentration on one source of data, the house buyer questionnaire, as this source provided the most significant and relevant results.

However the study benefited from:

- a structured approach to questionnaires, interviews and surveys in which participants were asked the same questions in the same order
- efforts which were made to attempt to eliminate bias or leading statements from questions
- efforts which were made to present results and analysis in a clear and unbiased way

5.5. Future Research

There are a number of avenues open to further research:

1. A study of greater breadth: collecting similar questionnaire, survey or interview data on a regional or national scale. This could explore whether the findings of this study apply at a larger scale. A study of this type could assist national policy work, such as successors to Warm Homes, Greener Homes.
2. A statistical study: using real transactional data from the UK house market to test the hypothesis that solar panels increase the price of properties. A study of this type could seek to provide tangible evidence to assist professional bodies in the field, such as RICS, NHER and EST.
3. A study of greater depth: investigating correlations between preferences for solar by prospective property buyer's age, gender or by the characteristics of property sought. This could explore whether correlations indicated by this study (5.1.1) have any substance. A

study of this type could assist those marketing homes with solar panels.

4. A study of influential factors: gauging the impact on homebuyer's opinions of different sorts of information on properties with solar energy through focus groups or more detailed, possibly online, questionnaires. This could test the relative value of factors found to be influential in this study such as information on savings or technology (5.2.3 & 5.3.3). A study of this type could help policymakers improve EPCs or provide guidance to those selling homes with solar.
5. A study of aesthetic preferences: testing the preferences of property buyers towards different types of solar panel via choice experiments. This could explore whether the tentative aesthetic preferences suggested by this study are replicated. This could assist solar panel manufacturers and householders considering investing in solar.

6. CONCLUSIONS

The study has met its aim to shed light on the aesthetic and social responses to solar panels and its findings tentatively support the hypothesis that solar panels increase the value or saleability of the properties in Oxford on which they are installed.

The two key findings of the study are that currently demand for properties with solar is not being reflected by property values and that householders are currently not being provided with the information on fuel bill savings that might influence their purchase decisions.

Analysis of potential buyer, estate agent and householder responses indicates that solar energy increases rather than decreases the saleability of domestic properties in Oxford; amongst the prospective property buyers questioned the overall aesthetic and social response to solar panels was positive and the findings suggest that, on aggregate, between one sixth and one third for of householders would be more likely to buy a property with solar panels, in a like-for-like situation⁵⁸.

However the study finds much weaker evidence to indicate that panels affect the value of properties, only a quarter of prospective buyers who would be more likely to buy a property with solar said they would pay more for it. As such the findings indicate that solar thermal and photovoltaic panels would add a negligible amount to the value of properties: £250 - £290⁵⁹.

Therefore the primary implication is that demand does exist for properties with solar panels in Oxford but it is not, at present, being translated into increased property values.

Amongst estate agents responses were largely negative or uncertain on the demand for properties⁶⁰ with solar and negative about any value added⁶¹. As agents control both the initial valuation and information provided on properties it is likely that these opinions are currently being reflected in the valuations given and information provided about properties with solar in Oxford.

This therefore support the assertion that a 'vicious circle' exists around sustainability and value; that property professionals do not draw attention to renewable energy because they believe it will not add value and as a consequence buyers do not get the opportunity to express a preference for it⁶².

58 Dependent on the type of panels, see Analysis 5.1.1

59 See Analysis 5.1.2

60 See Analysis 5.2.1

61 See Analysis 5.2.2

62 See Analysis 5.1.2

The study explored the expectations associated with properties with solar panels and found a large discrepancy between the expectations of those who had installed solar panels and those of other householders. Almost half of those who had installed solar panels thought that the panels would add value to the property, whereas only 17% of prospective buyers questioned said they would pay more for them.

The implications of this are that, if vendors ask more for properties with solar panels than potential buyers are willing to pay, this in turn may decrease the saleability of these properties.

Along with positive responses to solar amongst house buyers and householders the study also found significant ambivalence towards properties with solar panels⁶³. One possible explanation for this ambivalence is that householders lack information about the savings associated with solar panels. As information on savings is key to calculations of net present value⁶⁴ this might reinforce the low 'value added' of solar that this study implies.

This explanation is supported by the second key implication of the study; that, regarding properties with solar in Oxford, prospective buyer's purchase decisions are highly influenced by information on fuel bill savings⁶⁵ and that currently this information is not being provided to them⁶⁶.

Therefore this study finds strong evidence to suggest that providing information about fuel savings at or before the point of sale might increase the price or saleability of these properties. The study also implies that information from surveyors and energy efficiency ratings are influential on buyers purchase decisions and therefore that these could be appropriate channels for information about fuel bills savings.

63 See Analysis 5.1.1 and 5.3.1

64 See Hypothesis 3.2

65 See Analysis 5.1.3 & 5.2.3

66 See Analysis 5.3.3 & 5.2.2

7. RECOMMENDATIONS

This study concludes with two recommendations regarding properties with solar panels:

1. Providing information to prospective buyers.

This study recommends that estate agents, and other property professionals, include information about solar panels, particularly annual fuel savings, in property information.

Information on fuel savings was ranked most influential by more than half of all prospective buyers in this study, therefore ensuring this information is accessible will maximise the value and saleability of these properties.

This could be in the form of a detailed handout such as that provided by the Energy Saving Trust (EST, [2010b](#) / [2010c](#)) or simply a statement about expected savings in the property's information (EST, [2010e](#) / [2010b](#))

2. Establishing whether there is demand on a national scale.

Section 5.5, Future Research, indicates there is a wealth of studies that would be valuable on in this area, however his study concludes that the most valuable of these would an exploration of whether demand for properties with solar panels exists on a national scale.

As demonstrated by this study, and reinforced by the findings of previous research, property professionals are currently unaware of demand for sustainable features and therefore do not draw client's attention to them. This creates a cycle of unawareness of demand for, and undervaluation of, properties with these features.

In order to break this cycle research is needed to authoritatively establish whether there is demand for this type of feature and therefore inform professionals as to whether current valuations are accurate.

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