# Consumers' Willingness to Pay Research

## Final Report

## July 2012


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File name: 2383rep01 - v17 - final

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## Executive Summary

Research was conducted to determine consumers' willingness to pay for mitigation of the visual impact of electricity infrastructure in National Parks and Areas of Outstanding Natural Beauty/National Scenic Areas.

The research comprised a qualitative phase of 10 extended focus groups, followed by a quantitative survey of 1002 consumers using stated preference methods.

The qualitative work indicates that mitigation of visual impact of existing electricity infrastructure is not a high priority for most consumers. Most do not find existing electricity infrastructure a major visual intrusion or consider that it significantly reduces their enjoyment of the countryside. Many consumers are under financial pressure from increasing household bills and in some cases reduced income as well. They would find it hard to pay more on their bills and do not see this as a priority area. They appear to have more appetite for paying for mitigation of the visual impact of future infrastructure than for existing infrastructure.

The quantitative survey indicates that affordability is a widespread issue with most households saying they have experienced rising household bills and falling or static household incomes. The perceived size of the electricity bill among the sample is £671 per annum, higher than the published figure by Ofgem.

Just over half of consumers consider electricity infrastructure to be 'ugly and an eyesore', and the majority think it is 'necessary and unavoidable'. Attitudes towards infrastructure do not vary very widely between those who live in, or frequently visit, designated landscapes, or who are able to see infrastructure from their home. If anything those who are more likely to view the infrastructure are marginally less concerned about it.

Most consumers accept that there is a need to lessen the visual impact of transmission infrastructure and that the countryside would be improved by doing so. However they are polarised on whether this is a good use of money at this time and on whether it is fair to ask customers to pay for these improvements. Nearly half say they would find it hard to pay more on their electricity bill.

The quantitative survey tested consumers' willingness to pay for mitigation of visual impact of electricity infrastructure in the context of a time limited investment programme which would last 8 years and if implemented would result in an increase to consumers' annual bills for each year of the investment programme.

The data were collected using a choice experiment in which respondents provided a full preference ranking of four alternative scenarios, each of which included a "no mitigation" option available at zero additional cost.

The other three options each involved a specific type of mitigation located in one of National Park, Area of Outstanding Natural Beauty/National Scenic Area (AONB/NSA), or in other rural areas. The mitigations were defined in terms of the mitigation type (replacement with T-pylon, re-routing, screening or undergrounding) and in terms of the length of the tract to mitigate (5, 10, 20 and 50 miles).

Overall the stated preference exercise provides evidence that the most valued mitigation interventions are those associated with large projects over 20 miles for AONBs/NSAs and over 50 miles in all areas. The highest benefit is obtained from undergrounding projects, followed by screening with trees.

Short length mitigation projects of 5 and 10 miles show significant sensitivity to neither location nor length. However, the relative ranking of mitigation types is consistent with that observed in larger projects, with undergrounding producing an estimated benefit of £13.40 per household per annum, screening of £8.65, T-pylons of £1.75 and re-routing of £0.70.

For programmes of 20 miles, consumers are more sensitive to location. For a programme of 20 miles in AONBs/NSAs they are willing to pay more than for the same programme in National Parks or other rural areas. WTP for undergrounding 20 miles of infrastructure in AONBs/NSAs rises to £16.27. WTP for a programme of other mitigation measures in AONBs/NSAs also increased with the measures remaining in the same order and proportion as before.

The scenario with the highest WTP is a 50 mile programme of undergrounding in AONBs/NSAs. Consumers are willing to pay an additional £20.33 per annum to achieve this level of mitigation. The value of a similar programme in National Parks is not significantly different, at £19.84.

About 80% of respondents stated they would pay for at least one of the scenarios they were offered. Analysis of the determinants of this group disclosed that for some features they tend to be significantly different from those who always rejected options that involve some payment. Those with positive WTP are more likely to have visited at least once an AONB/NSA and to strongly agree with "the need to lessen the visual impact of existing transmission structures". Strongly agreeing with statements concerning one's "difficulty to pay more in the electricity bill" and with the assertion that "it would not be a good use of money to do so at this time" are, in contrast, linked with lower probability to have a positive WTP.

Considering the comparative preferences for such investment in current compared with new infrastructure, five per cent of bill payers would prioritise mitigation of existing infrastructure without consideration of whether it is at the end of its life and needs replacing. A further 25% would prioritise mitigation of existing infrastructure, but only when it needs replacing. Most would prefer mitigation of both existing infrastructure, but only when it needs replacing, along with new infrastructure.

Investment in mitigation of electricity infrastructure is considered much less important than investment in making homes energy efficient, investment in renewable energy and in cleaning rivers and other waterways. It is however considered a little more important than investment in high speed rail or new roads.

# 1. INTRODUCTION

## 1.1 Background

National Grid owns and maintains the high voltage electricity transmission system in England and Wales.

The company is regulated by Ofgem, who carries out price control reviews to set permitted revenues. RIIO-T1 (formerly known as TPCR5) is the first transmission price control review to reflect the new regulatory framework resulting from Ofgem's RPI-X@20 review. The RIIO model (Revenue = Incentives+Innovation+Outputs) builds on the success of the previous RPI-X regime but has a greater focus on incentives to drive the innovation that is necessary to deliver a sustainable energy network combined with value for money for consumers, now and in the future.

Stakeholder consultation is an important component of the RIIO framework. National Grid Transmission had already engaged extensively with stakeholders, including research into consumers' willingness to pay (WTP) to reduce the impacts of existing transmission infrastructure on visual amenity in designated landscapes. However, this research was acknowledged to have been limited in scope[1]; National Grid therefore wished to address the weaknesses of that research.

To this end, National Grid Transmission commissioned Accent to conduct more comprehensive WTP research among electricity household consumers to determine willingness to pay to mitigate the visual impact of existing lines and pylons in England, Wales and Scotland.

## 1.2 Objectives

The key objective of the research was to establish how willing electricity household consumers are to pay for mitigating the visual impact of existing transmission infrastructure in National Parks (NPs) and Areas of Outstanding Natural Beauty (AONBs)/National Scenic Areas (NSAs), thereby enabling National Grid to derive an estimated WTP value from the analysis of the consumer research.

In discussion with National Grid it was agreed that eliciting WTP for the mitigation of the visual impact of existing lines would be the primary objective of the research. It would also be of interest to explore preferences for prioritising existing or new

[1] The most significant problem with National Grid's consumer survey was identified as being methodological, in particular the focus on undergrounding as the only mitigation option, the apparent lack of a theoretically consistent welfare measure and the flawed implementation of the payment card approach. The lack of analysis of the results was the next most significant drawback, followed by poor implementation and framing. The latter affected the interpretation of the results of the open-ended questions, which can be considered to be relatively more reliable estimates of WTP than those provided by the payment card approach used in the survey. However, with the above caveats the authors of the review believed that the average WTP derived from the open-ended questions could be used as a rough estimate of consumers' WTP for undergrounding in England and Wales, although they did not believe the Scottish data to be sufficiently robust to use in a value transfer exercise for application in Scotland. *(Review of company surveys on consumers' willingness to pay to reduce the impacts of existing transmission infrastructure on visual amenity in designated landscapes; London Economics, 2011)*

infrastructure for mitigation and this was explored in the initial qualitative research. It was not, however, a consideration for the stated preference exercises. Consumers' preferences between the mitigation of new versus existing lines were therefore explored attitudinally, in the quantitative research but not included in the stated preference exercises, which focused solely on existing infrastructure.

The research programme took account of a number of issues, including:

- the different types of mitigation available to lessen the visual impact of National Grid's transmission infrastructure (ie not just undergrounding)
- the cost of mitigation on consumers' bills
- options around who should pay for the mitigation
- the priority of consumers to address the visual impact of new versus existing infrastructure
- the value consumers place on visual amenity in different types of landscapes.

The research, methodology, analysis and conclusions will be subject to peer review, including by Ofgem, and Accent therefore took account of best practice in this area.

# 2. METHODOLOGY

## 2.1 Introduction

The research programme comprised qualitative, quantitative and stated preference elements.

Stated preference methods are widely used for valuing goods for which markets are absent for a variety of reasons and under a variety of circumstances. The theory and practice of measurement and estimation of the economic value for market goods is well understood and specific guidelines for applications exist. In practice though, the estimation of such values is often inaccurate due to a variety of econometric problems. For non-market goods things are complicated by the absence of market transactions which are – by definition – not available. The theory of measurement, however, is still valid and can be applied in contingent markets. These are survey-based studies that elicit preferences from respondents contingent upon the creation of experimentally designed and hypothetical market scenarios. This is what is done in practice by stated preference studies based on contingent valuation and choice experiments and aimed at the determination of willingness to pay. Richard Carson (2011) has produced a bibliography listing over 2,000 studies world-wide. Stated preference valuation methods are now well understood and protocols of application exist for a variety of uses, including for litigation purposes in a court of law. These protocols are based on the academic consensus emerged from a debate that has been ongoing since the early 1980s. Based on these SP studies are routinely used to inform a variety of decisions taken by regulatory agencies and by national and international agencies, such as the OECD and the World Bank, that implement policies impinging on the supply of public goods. Stated preference studies are also likely to be required as subsidiary means of assessing the outcome of economic development projects funded by the EU Commission, such as those funded by DG-Regio.

## 2.2 Qualitative Methodology

The initial qualitative stage tested attitudes towards transmission infrastructure in the countryside, the terminology most easily understood by participants and the helpfulness of show material used. It also established broad parameters for willingness to pay that could be used in the subsequent quantitative and stated preference elements.

The qualitative phase comprised a programme of ten focus groups, each lasting two hours. A standard focus group lasts 90 minutes. The extended format of two hours was considered necessary to allow time to ensure participants had a good understanding of the electricity supply chain and the role of National Grid Transmission within that supply chain, as well as a good understanding of other relevant issues.

All participants were responsible, either solely or jointly, for paying their electricity bill.

Locations were selected to provide coverage of urban and rural locations in England, Wales and Scotland.

Across these locations, the group structure included a range of age groups and socio-economic grades (SEGs[2]). All groups were mixed gender, and each included a minimum of two respondents who were 'users' of countryside. Usage of the countryside was determined through the following question, with at least two attendees per group giving code 2 or code 3 as a response:

**Q How often have you visited or used the countryside for leisure purposes?**

1. Never
2. Less than four times in the past twelve months
3. Four times or more in the past twelve months

The group structure is set out in Table 1 below.

**Table 1: Group Structure**

| Region | Urban/Rural | Location | Age | SEG |
|---|---|---|---|---|
| Midlands | Urban | Birmingham (viewed) | 40-59 yrs | C2DE |
| South West | Urban/rural | Plymouth | 16-39 yrs | ABC1 |
| South | Rural | Arundel | 60+ yrs | ABC1 |
| London | Urban | Central | 60+ yrs | C2DE |
| East of England | Urban/rural | Ipswich | 40-59 yrs | C2DE |
| North East | Rural | Scarborough | 16-39 yrs | C2DE |
| North West | Urban | Manchester | 16-39 yrs | ABC1 |
| Wales | Rural | Carmarthen | 40-59 yrs | ABC1 |
| Scotland | Urban | Glasgow (viewed) | 40-59 yrs | C2DE |
| Scotland | Rural | Perth | 60+ yrs | C2DE |

Focus groups were held between 31 January and 21 February 2012. The first group (in Birmingham) was held in a viewing facility to enable representatives of National Grid to observe and comment on. The Glasgow group was also held in a viewing facility to enable a Scottish Power representative to observe.

The viewed groups were audio and video recorded, with the others being audio recorded, to aid analysis.

The topic guide and show material were designed in close cooperation with National Grid and approved by them in advance of any fieldwork. They are attached as Appendix A and Appendix B respectively.

The findings were presented to National Grid on 06 March 2012, and are set out in Section 3. The presentation of the qualitative findings is attached as Appendix C.

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[2] Definitions of SEGs:
A = Higher managerial/ professional/ administrative;
B = Intermediate managerial/ professional/ administrative;
C1 = Supervisory or clerical/ junior managerial/ professional/ administrative, student;
C2 = Skilled manual worker;
D = Semi or unskilled manual work;
E = Casual worker, not in permanent employment, Looking after the home, Retired and living on state pension, Unemployed or not working due to long-term sickness, Full-time carer of other household member.

## 2.3 Quantitative Methodology

### Questionnaire

The questionnaire was designed in close cooperation with National Grid, drawing upon discussions with the client and on the results of the qualitative research.

The questionnaire included the following topics:

- Screener
  - Qualification (bill payer)
  - Quota questions

- Use of the countryside
  - Explanation of NPs and AONBs/NSAs
  - Proximity to these areas
  - Visit/usage of countryside

- Electricity bill and financial questions
  - Bill size questions
  - Changes in financial situation in past two years
  - Views on long term or short term change

- Electricity infrastructure
  - Explanation of the industry and National Grid's role
  - Views on pylons and other infrastructure
  - Mitigation measures: explanation and rating

- Stated Preference Exercise

- Diagnostic questions
  - Ease of considering the information and making choices

- Contextual questions
  - Considerations in choices
  - Priorities for investment in mitigation of current infrastructure vs new and importance of mitigation at 'end of life' of assets
  - Attitude to investment in other areas of national infrastructure

- Classification questions
  - Household characteristics
  - Highest education level
  - Membership of environmental groups

- Interviewer diagnostic questions
  - Assessment of respondent understanding and consideration of tasks.

A copy of the questionnaire is included as Appendix D to this report.

## Stated Preference Design

The survey included a choice experiment based on the best-worst ranking of four alternatives arranged in four choice sets for respondents. This preference elicitation method is based on the principle that respondents make lower cognitive effort in identifying extremes (best and worst) when presented with the task of ranking a series of alternatives. Less effort is normally associated with more informative data.

Each scenario included four labelled options. Three labels referred to mitigations in locations (National Parks, AONBs/NSAs and other rural areas), available at a tariff increase for the duration of the project (8 years). The fourth was represented by a "do nothing" alternative available at no additional cost. The last was included for completeness of the set of alternatives and to enable the identification of respondents with zero willingness to pay. Each of the alternatives was described in terms of three choice attributes: extent of mitigation, mitigation method and cost per year for the duration. Each attribute was expressed in four levels, as described in Table 2.

**Table 2: Variables for Choice Sets**

| | Level 1 | Level 2 | Level 3 | Level 4 |
|---|---|---|---|---|
| **Extent of mitigation** | 5 miles | 10 miles | 20 miles | 50 miles |
| **Method** | Undergrounding | Replacement with T-pylons | Screening with trees | Rerouting |
| **Bill** | £2 added to your current bill this year and each year from now on for the 8 year project duration | +£5 added to your current bill this year and each year from now on for the 8 year project duration | +£10 added to your current bill this year and each year from now on for the 8 year project duration | +£20 added to your current bill this year and each year from now on for the 8 year project duration |

The arrangement of the attribute levels was defined by using a fraction of the full factorial. Forty choice sets were developed using an optimal orthogonal array and four of each were allocated into 10 blocks. Each respondent assessed one block of four choice sets which were presented to them by rotating the position of the project locations. In this way any systematic bias (eg left to right bias) was avoided. The D-optimality criterion of the experimental design was 99.32%. The ex-post valuation of the design confirmed its adequacy for the purpose of estimating the required effects.

## Pilot

A pilot of 30 interviews was conducted to test the length of the questionnaire, understanding of the terminology and of the electricity supply chain, and the helpfulness of the show material. It also tested the stated preference design.

Two key findings emerged from the pilot with regard to the questionnaire:

- the questionnaire was too long and repetitive
- the show material needed to be refined (and adapted to match the shortened version of the questionnaire).

The repetition of the phrase "lessening the visual impact of transmission infrastructure on the landscape" made the questionnaire wordy to administer, and the incidence of this phrase was reviewed so that, while it appeared in the show material, the interviewers did not repeat it so often.

In particular, the wording of Q41 was shortened, with more of the text being put into show material:

**Q41: Pilot Version**

We have been asking you to consider the visual impact of existing electricity transmission infrastructure on the countryside. However, National Grid and Scottish Power will have to put in place more infrastructure over the next 8 years to connect new sources of electricity. This new infrastructure will be installed in close consultation with local communities and other stakeholders. Please say which of these statements most closely matches your opinion. Do you think that the electricity transmission companies (eg National Grid and Scottish Power) should...

1. …prioritise lessening the visual impact of existing infrastructure in protected areas
2. …prioritise lessening the visual impact of existing infrastructure in protected areas but only when it comes to the end of its natural life and needs replacing
3. … prioritise lessening the visual impact of future infrastructure
4. …give equal priority to lessening the visual impact of existing infrastructure in protected areas and future infrastructure
5. …give equal priority to lessening the visual impact of existing infrastructure in protected areas, when it needs replacing, and future infrastructure

**Q41: Main Stage Version**

In terms of reducing the visual impact of power infrastructure, do you think National Grid/Scottish Power should prioritise...

1. … existing infrastructure in protected areas
2. … existing infrastructure in protected areas but only when it comes to the end of its natural life and needs replacing
3. … future infrastructure
4. … all existing infrastructure in protected areas and future infrastructure equally
5. … give equal priority to lessening the visual impact of existing infrastructure in protected areas, when it needs replacing, and future infrastructure

As a result of implementing changes to the questionnaire following the pilot, the average questionnaire length was reduced from 38 minutes to 24 minutes.

The stated preference exercises were found to work well in the pilot and respondents reported good understanding of the task.

The design in the pilot was identical to that described above except that the bill variable used the levels £1, £2, £5, £10. On examination of the pilot data it emerged that choices at £5 and £10 were very similar. It was therefore decided to increase the levels of the bill variable to ensure that a wide enough range of prices was included. The bill variable was increased to include the levels: £2, £5, £10, £20.

## Recruitment

The quantitative fieldwork was conducted through a phone-post/email-phone methodology.

Respondents were screened to be responsible, solely or jointly, for paying their household's electricity bill or to have a say in choosing their household's electricity supplier. The screening questionnaire also checked respondents' status with regard to age, gender, income, SEG and the location of their main home (urban or rural). Guide quotas were set on these dimensions to check that the sample was representative of the population on these measures. The quotas were set on the basis of 2001 Census statistics on Household Reference Person, as a proxy for bill payer.

On recruitment, respondents were invited to take part in the main survey immediately or at a later time more convenient to them.

Show material and randomly generated stated preference exercises were then emailed to those with internet access or posted to respondents. Quantitative show material is included as Appendix E.

Accent purchased sample from its approved supplier comprising telephone numbers of households representative of the head of household profile in terms of age, gender, income, SEG and urban/rural locations across England, Scotland and Wales. Details of respondent profile are given in Appendix F.

Quotas were not met in terms of age, urban/rural location and region, as Table 3 shows, and the data was therefore weighted to the profile of the 2001 Census.

**Table 3: Desired and Achieved Quotas for Quantitative Survey**

| | Penetration | Expected (1,000) | Min | Max | Achieved (1,002) |
|---|---|---|---|---|---|
| **Region (Q4)** | | | | | |
| North East | 4.5% | 45 | 40 | 49 | 58 |
| North West | 11.8% | 118 | 106 | 130 | 118 |
| Yorkshire and The Humber | 8.7% | 87 | 78 | 95 | 77 |
| East Midlands | 7.3% | 73 | 65 | 80 | 82 |
| West Midlands | 9.0% | 90 | 81 | 99 | 93 |
| East | 9.4% | 94 | 84 | 103 | 47 |
| London | 12.6% | 126 | 114 | 139 | 82 |
| South East | 13.8% | 138 | 124 | 152 | 192 |
| South West | 8.7% | 87 | 79 | 96 | 94 |
| Wales | 5.1% | 51 | 46 | 56 | 60 |
| Scotland | 9.2% | 92 | 83 | 101 | 99 |
| **Urban/rural (Q5)** | | | | | |
| Urban | 80.1% | 801 | 721 | 881 | 535 |
| Town and fringe | 9.6% | 96 | 86 | 105 | 185 |
| Village | 7.3% | 73 | 65 | 80 | 226 |
| Hamlet | 3.1% | 31 | 28 | 34 | 56 |

| | Penetration | Expected (1,000) | Min | Max | Achieved (1,002) |
|---|---|---|---|---|---|
| **Gender (Q6)** | | | | | |
| Male | 60.4% | 604 | 544 | 664 | 571 |
| Female | 39.6% | 396 | 356 | 436 | 431 |
| **Age (Q7)** | | | | | |
| Under 24 | 3.5% | 35 | 31 | 38 | 8 |
| 25 to 34 | 16.3% | 163 | 146 | 179 | 66 |
| 35 to 44 | 20.4% | 204 | 184 | 225 | 141 |
| 45 to 54 | 18.8% | 188 | 169 | 207 | 234 |
| 55 to 64 | 15.3% | 153 | 138 | 168 | 243 |
| 65 to 74 | 14.1% | 141 | 127 | 155 | 200 |
| 75+ | 11.6% | 116 | 104 | 128 | 110 |
| **SEG (Q9)** | | | | | |
| AB | 20.7% | 207 | 186 | 227 | 218 |
| C1 | 30.4% | 304 | 274 | 334 | 335 |
| C2 | 13.3% | 133 | 120 | 147 | 158 |
| D | 16.3% | 163 | 147 | 179 | 116 |
| E | 19.3% | 193 | 174 | 212 | 151 |

## Age

It is known to be difficult to meet age quotas when conducting research among bill payers, with the younger age groups in particular being difficult to recruit. Accent had purchased additional sample for the younger age groups to help address this problem but the older age groups were still over-represented.

## Urban/rural location

Respondents were asked to say which of the following best describes where they live (ie their main residence):

- urban (ie population over 10,000)
- rural, town and fringe
- rural, village
- rural, hamlet & isolated dwelling.

These codes are as used by Defra.

The respondent base contained insufficient numbers of urban dwellers. It should be borne in mind that respondents were classifying themselves so were coded according to their perceptions rather than on fact.

There may have been some misunderstanding around the definition of ‘town and fringe’. Accent therefore reviewed the postcodes of those responses coded as ‘town and fringe’ and a large number were found to be ‘urban’ and so recoded.

However, it was felt that a respondent would know whether they live in a smaller rural area. A small number were checked as a precaution and found to be accurate. Village, hamlet & isolated codes were therefore not reviewed.

### Region

London and the East were both under-represented in the data while the South East was over represented. London is often found to be difficult to survey so this was perhaps not unsurprising. Other regions were very close to what was required.

# 3. QUALITATIVE FINDINGS

## 3.1 Introduction

The qualitative research was designed to inform the quantitative research and the stated preference design and explored:

- affordability
  - to provide a context in terms of participants' financial situation and household commitments for subsequent discussions regarding willingness to pay
- understanding of the electricity supply chain
  - and education to ensure a focus on the transmission element
- understanding of designated landscapes
  - and education to ensure a focus on the landscapes under discussion
- views on transmission infrastructure in general and in particular landscape settings
- views on measures for lessening the visual impact of transmission infrastructure on the countryside
- willingness to pay for measures to lessen the visual impact of transmission infrastructure on the countryside.

## 3.2 Affordability

**Key Findings**

- Participants across all locations say that their food bills have risen dramatically and that petrol/diesel, gas and electricity have also gone up; at the same time, their household incomes have remained static
- They have made changes to their behaviour in response to these increases, such as shopping at cheaper supermarkets, seeking out special offers, reducing car journeys

It was important to have an understanding of participants' current affordability at a general household level before moving on to any discussion regarding willingness to pay.

Participants were invited to consider their main household bills and any changes to their household expenditure over the last couple of years in light of the economic climate.

Across all locations and SEGs participants say that their household bills have gone up "dramatically" over the past two years while incomes had remained static. Food, petrol and diesel, energy and entertainment are widely mentioned as key areas where costs have risen. Insurance is also mentioned by some, with a small number of participants saying they have reduced the level of cover provided in order to save costs.

There is widespread agreement that food bills in particular have increased – many participants say they have almost doubled. Participants have cut back on food purchases and regularly look out for special offers, for staples or for luxuries. Many say they have switched to a cheaper supermarket.

Petrol and diesel prices have also increased noticeably, so that some participants say they have stopped making certain trips altogether or use public transport more often.

Gas and electricity bills have gone up and participants speak of turning their thermostat down, wearing more clothes indoors and not heating some rooms. Some of the 65+ year olds in London choose to spend the day in the library or a café where it is warmer.

Participants have also cut back on recreation and entertainment. For example, whereas it used to be commonplace to go to the pub once a week, many no longer do this. It is much cheaper for them to stay in, particularly if they can watch sport and/or films at home.

## 3.3 Understanding of National Grid

**Key Findings**

- There was little understanding of the electricity supply chain and of National Grid's role in transmission
- The show material was essential in enabling participants to discuss the issues surrounding the transmission infrastructure

There was low understanding of National Grid's role in the electricity supply chain. Although a number had searched for relevant information on the internet, others suggested a mix of general descriptions, eg:

- "Generates electricity"
- "Carries electricity"
- "Distributes electricity
- "Supplies electricity"
- "Gas and electricity".

It was important for the research that participants understood the different functions in the electricity supply chain and where, in particular, transmission sits in that chain. Participants were given a showcard (Showcard B in Appendix B) that that they could refer to throughout the discussion to remind them if necessary.

Participants were also shown the breakdown of an average electricity bill ie £424 pa (source: Ofgem) where 4% goes towards the costs of transmission.

## 3.4 Understanding of Designated Landscapes

**Key Findings**

- Apart from participants who live near AONBs or National Parks, there was low awareness of the designated landscapes under discussion and show material was essential in providing the necessary information to participants to enable them to consider the importance of these landscapes

Apart from participants who live near to designated landscapes (eg in Arundel, Ipswich and Plymouth), unprompted understanding of National Parks or Areas of Outstanding Natural Beauty (AONBs) was generally found to be low.

Participants suggest that National Parks require special planning and protect wildlife. The few who had heard of AONBs suggest that they may be 'areas of national beauty'.

Following the unprompted comments, participants were given shown material showing definitions, maps and lists of National Parks and AONBs to which they could refer to during the discussion. These are included in Appendix B to this report.

Despite their initial low awareness, participants mostly feel that, since the landscapes had been designated in order to protect them, that designation should be respected.

## 3.5 Initial Views on the Impact of Transmission Infrastructure on the Landscape

**Key Findings**

- Participants mostly consider electricity transmission infrastructure to be a necessary evil
- They are used to seeing pylons across the countryside so that they generally accept or do not notice them; only a small minority view them negatively

Participants are mostly pragmatic about transmission infrastructure and consider them to be a necessary evil, a price to be paid in return for receiving a good electricity supply that provides them with everyday essentials:

> *"I don't like them but I want to be able to have a shower and a cup of coffee in the morning"*
> Plymouth (ABC1, 16-39 yrs)

Familiarity plays a large part in participants' acceptance of transmission infrastructure. They have, they say, grown up with them and they have always been there. As a consequence, they do not notice them particularly, and "filter them out".

A minority have strong negative perceptions of transmission infrastructure, and describe them as "an eyesore" that "march across the countryside" or spoil it with their appearance of "washing lines".

A very small number consider the transmission pylons to be iconic, an engineering achievement and much better than those seen in other countries.

## 3.6 Detailed Views on the Impact of Transmission Infrastructure on the Landscape

**Key Findings**

- Infrastructure spanning water was heavily criticised: the reflection increased its impact on the countryside
- Infrastructure on hill tops and across flat land was also widely disliked
- Where a landscape was considered unattractive, transmission infrastructure was generally considered acceptable
- The images used were very helpful in prompting discussion but considered inappropriate for use in the quantitative survey as they were too obviously influential (positively and negatively), depending upon their perspective and focus

Participants were asked to consider a number of different landscapes. They were first shown an image of each landscape with a pylon, then the same landscape with the pylon removed. Seven landscapes were selected and included hills, flat countryside, farmland and uncultivated land, countryside with houses or with farm buildings, and a water scene. The images used are included in Appendix B to this report.

In most cases, the pylons were considered to "dominate" the landscape, with the landscapes being greatly improved by their removal.

Where participants were less concerned about the impact of the infrastructure, this was generally because they did not consider the landscape to be very attractive.

The water scene was largely considered to be the most attractive scenery and drew the strongest reactions against the infrastructure.

Participants were more accepting of infrastructure in cultivated farmland, and where there were already farm buildings.

There was little difference between groups in their reactions to the images apart from Glasgow, where participants were mostly ambivalent towards all images showing transmission infrastructure.

The images of landscapes with and without pylons served as useful prompts and were very helpful in generating discussion. However, most of them are, primarily, images of pylons rather than of the countryside and do not reflect the way in which participants say they generally look at the countryside. Typically, participants say they look at the wide sweep of countryside, focusing on the most interesting or attractive parts and filtering out the electricity infrastructure or facing away from it. In contrast, some of the images are dominated by the infrastructure.

Participants illustrated this by their responses. A scene that includes a pylon on top of a hillside or on flat countryside, for example, is ultimately, a picture of a pylon and generated stronger criticism. A more sweeping view of the countryside which includes farm buildings as well as pylons across farmland and hills, or a view that looks down on a pylon, received less criticism. It was clear that the images could potentially be prejudicial depending upon their perspective and, possibly, influence responses.

It was therefore decided not to use the images in the quantitative research, including the stated preference exercises. Instead, respondents in the quantitative survey should consider their own experiences or perceptions of viewing transmission infrastructure in the countryside without visual examples.

## 3.7 Alternatives to Pylons

**Key Findings**

- The T-pylon was widely considered to be the most attractive alternative; it was expected to be considerably less expensive than undergrounding and less intrusive than current infrastructure
- While undergrounding was considered to be a very attractive alternative to pylons, participants were concerned about the cost, the impact on wildlife and flora, and damage to tourism
- Carmarthen participants had experienced three years of work installing a new gas main from Milford Haven and were more accepting of the potential upheaval associated with undergrounding
- Screening with trees was considered to be limited in its effectiveness although, where it was appropriate and with the caveat that trees suited to the landscape were chosen, was seen to have benefits
- Rerouting held very limited appeal; the water scene encouraged participants to consider rerouting where insufficient consideration appeared to have been given to the siting of pylons, but it was largely considered to be relocating a problem rather than solving it

### Introduction

Unprompted, participants were for the most part aware that power lines could be undergrounded and, initially, very much in favour of this. A small number were also aware of the competition for a new pylon design.

They were then presented with four alternatives for consideration:

- undergrounding
- screening (eg with trees)
- rerouting
- replacing with the new T-pylon.

In addition, and for the qualitative phase only, participants were asked to consider undergrounding distribution infrastructure as an alternative approach.

### Undergrounding

Undergrounding was mentioned spontaneously in all groups but assumed to be expensive.

It was suggested that lines could be put underground alongside roads or canals and should be coordinated with other utilities. The images of undergrounding work (see Appendix B) caused participants to reconsider as they had clearly not appreciated the scale of the engineering work involved.

Carmarthen participants were the exception to this. They had experienced (over some three years) a new gas main being laid from the Milford Haven terminal and were happy that all work was finished and the landscape returned to normal. It had been an inconvenience, but that was all.

Scarborough participants were concerned that undergrounding work would have an immediate impact on its tourism industry from which it may subsequently be difficult to recover.

Participants were concerned about the potential impact of the works on wildlife habitats and were divided as to whether undergrounding would benefit or disrupt designated landscapes.

Some considered that the long view was important and that consideration should be given to the benefits for future generations.

### Screening

Screening by trees may conceal sub stations or hide transmission pylons from a particular vantage point.

Participants were generally in favour of tree screening where suitable, but think it important that trees should fit with existing natural vegetation, particularly if planting in designated areas.

Planting trees could also help screen infrastructure that is visible *from* designated areas.

It was generally understood that screening by planting more trees would have less effect on the impact of the infrastructure than undergrounding.

### Rerouting

There was some support for rerouting, which would allow selected landscapes to be free of transmission infrastructure and move it to those landscapes considered to be “less damaged” by its presence. The water scene, for example, was widely considered to be a deserving candidate for rerouting the transmission infrastructure.

The criticism from participants was that rerouting does not solve a problem – it simply relocates it. Moreover, they would not want existing pylons moved purely for cosmetic reasons; they consider this to be an unnecessary expense.

### New Pylon Design

The new T-pylon design was universally liked and preferred to the existing design. Participants thought it could be acceptable in designated landscapes as it was considered to be less intrusive than current transmission pylons.

They did question, though, whether there would be more of them. It is some two thirds the height of current transmission pylons and they assumed more would therefore be needed to maintain the height of the power lines.

### Undergrounding Distribution Infrastructure

Distribution pylons are around two thirds the height of the transmission pylons and may therefore be seen as less intrusive. There are more of them and they are typically nearer houses than are transmission pylons.

Distribution power lines are also carried by wooden poles (more akin to telegraph poles) which, again, are considered to be less intrusive.

Participants were divided in their views on undergrounding distribution infrastructure. Some thought that as they are less intrusive and are more easily hidden by trees, it would be better to keep them. Others thought that, since they are nearer to where people live, it would be better to underground them.

This measure was not taken through to the quantitative stage, which was concerned solely with transmission infrastructure.

## 3.8 Current vs New Infrastructure

**Key Findings**

- Although the discussion focused primarily on existing infrastructure, participants spontaneously questioned whether any mitigation should apply to existing and/or future infrastructure; the overwhelming view was that any investment should focus on future infrastructure, with existing infrastructure only being considered for mitigation when it comes to the end of its natural life
- Participants feel strongly that money should not be spent on what is widely considered to be 'cosmetic'

National Grid is interested to know whether customers favour measures to lessen the impact of existing transmission infrastructure upon the landscape or whether they would rather the focus was on future infrastructure.

It was explained to participants that new infrastructure will be required over the next few years, for example to connect to low carbon power stations. The types of infrastructure and the routes chosen will be considered in consultation with local communities and other stakeholders.

Participants spontaneously considered whether the focus should be on new or existing infrastructure and are very much of the view that the emphasis should be on future infrastructure. Further, they think that existing infrastructure should only be replaced or rerouted as it came to the end of its natural life.

Replacing, rerouting or undergrounding existing infrastructure before then is considered to be a waste of money.

## 3.9 Willingness to Pay

**Key Findings**

- There is very little willingness to pay across all groups. Where it does exist, it is among ABC1 and rural groups but is still a minority view
- Willingness to pay amounts range from £5 a year to £50 a year
- Any willingness to pay is for future infrastructure and for current infrastructure only when it comes to the end of its natural life; there is strong opposition to spending money unnecessarily on current infrastructure for 'cosmetic' reasons in the current economic climate

Participants expected throughout the discussion that any costs for measures to lessen the impact of transmission infrastructure on the landscape would inevitably be reflected in their bills.

Initially there was no willingness to pay. Participants had already described how affordability levels have dropped considerably over the last two years and that they have changed their behaviour to accommodate this. Lessening the visual impact of transmission infrastructure on the landscape is therefore not important to them. They describe it as "purely cosmetic" and "prettification/beautification for the sake of it", and generally consider it to be unimportant at this time of financial constraint.

> *"I'm surprised that they are considering such niceties in the current economic climate."*
> Scarborough (C2DE, 16-39 yrs)

Alongside this, participants acknowledge that they may have given different responses in different times.

> *"Perhaps if you'd asked us in more affluent times we'd have given different answers."*
> Plymouth (ABC1, 16-39 yrs)

Undergrounding is seen as very expensive while screening is seen as largely ineffective. Rerouting perhaps attracts most criticism, with participants suggesting that if infrastructure has been put in the wrong place, it is solely the company's responsibility to rectify that.

> *"You put it in the wrong place, you fix it."*
> Scarborough (C2DEs, 16-39 yrs)

If money were to be spent on lessening the visual impact of transmission infrastructure on the landscape, participants say they want the case for it set out clearly.

> *"I would need 10 good reasons why this is necessary. It's because of this or that; the benefit to me will be this; the benefit to others will be that etc, etc."*
> Manchester (ABC1, 16-39 yrs)

There is very little willingness to pay. Where there is willingness to pay, it is mostly among ABC1 and rural groups and, even then, is far from the majority view:

- Birmingham (C2DE, 40-59 yrs)
  - a couple of participants would pay £5 a year more

- Plymouth (ABC1, 16-39 yrs)
  - a couple of participants would pay £10-£50 a year "to keep infrastructure off Dartmoor"

- Carmarthen (ABC1, 40-59 yrs)
  - a couple of participants would pay £10-£50 a year: "there's two in my household, that's £1 a week – perhaps go without the Sunday paper or a cappuccino"

- Arundel, ABC1, 60+ yrs
  - a couple of participants would pay £10-£20 a year ("we can afford it").

It should be noted that all willingness to pay found in the qualitative work is for future infrastructure and on existing infrastructure only when it has come to the end of its natural life and needs replacing.

There is no willingness to pay from the C2DE groups (apart from Birmingham), nor from Manchester (ABC1):

- Manchester (ABC1, 16-39 yrs)
- Scarborough (C2DE, 16-39 yrs)
- Ipswich (C2DE, 40-59 yrs)
- Glasgow (C2DE, 40-59 yrs)
- London (C2DE, 60+ yrs)
- Perth (C2DE, 60+ yrs).

Participants across all the groups suggest that funding for lessening the visual impact of transmission infrastructure on the landscape should come out of company profits. In particular they think it should come from the suppliers' profits, even though it was made clear to them that the suppliers' business is separate from transmission. In response to this, participants suggest that National Grid should be given more than 4% of the electricity bill.

## 3.10 Conclusions and Implications for Quantitative Design

The key points emerging from the qualitative research and the associated implications are set out below.

1 There are generally no strong feelings about the visual impact of transmission infrastructure upon the countryside; rather, the infrastructure is widely seen as a 'necessary evil' with the benefits to consumers far outweighing any disbenefits.

- **The questionnaire design should include questions on attitudes towards transmission infrastructure to measure the extent of these views**

2 Affordability is seen to be constrained across all regions and demographics and it clearly impacts upon willingness to pay; household finances have been increasingly

under strain over the past two years and, in this context, lessening the visual impact of transmission infrastructure is not viewed as a priority.

- **The questionnaire should include questions to assess respondents' financial situations to help determine where zero willingness to pay is driven by protest or by financial constraint**

3 There is clearly a strong dislike of replacing transmission infrastructure unless it is absolutely necessary to do so.

- **The questionnaire should include questions to measure the strength of preference for replacement only at 'end of life' or 'needing maintenance'**

4 There is a corresponding strong preference for investment in new rather than replacement infrastructure.

- **Although new infrastructure is not within the scope of the main study, the questionnaire should include questions to understand the strength of preference between investment in new vs replacement infrastructure**

5 Mitigation in different types of areas is viewed differently and priority is placed on mitigation in National Parks and AONBs.

- **Concentrating effort on these areas is logical for respondents**

6 However, understanding of National Parks and AONBs was found to be limited.

- **Definition and explanation of terms are required in the questionnaire**

7 Extent of wide ranging mitigation such as 'all lines in a National Park' is difficult for respondents to value.

- **Need to carefully explain the levels of any 'extent' variable in concrete terms (number of miles)**

8 The response to 'before' and 'after' pictures of the pylons was strongly influenced by the qualities of the individual pictures (eg type of landscape, angle and view).

- **Images of pylons will not be used in the SP as they inevitably introduce bias – use careful descriptions instead**

9 Responses to pylons differ for different types of landscape eg farmland, near water etc.

- **Test priorities for mitigation in different types of landscape to provide extra information to National Grid when planning mitigation about which landscape types are priorities to consumers (outside of the SP)**

10 Undergrounding is seen as the 'best' measure for lessening the visual impact of the transmission infrastructure.

- **Undergrounding to be the top level' of any 'type of mitigation' variable**

11 Other measures (ie rerouting, screening and undergrounding of distribution infrastructure) are difficult to communicate.

- **Detailed descriptions to be included in the questionnaire to communicate the implications of each method; (undergrounding of distribution infrastructure not included within the SP exercises)**

12 The T-pylon is widely liked but, although there is some awareness, not all have a clear image of it.

- **Use visual material to communicate what the pylon looks like**

13 There is an acceptance that, if payment is made by customers towards lessening the visual impact of transmission infrastructure, everyone should pay via the electricity towards mitigation.

- **This suggests that a financial variable using additions to electricity bill will be workable**

14 Willingness to pay ranges from £5 to £50 a year.

- **This provides an indicative range for the financial variable in the SP, though lower values are appropriate as these are only from those who are WTP**

15 Consumers find it confusing to think about increases over an extended time period

- **The cost increase to be given in the context of the 8 year investment programme to explain limits of cost increases**

# 4. QUANTITATIVE FINDINGS

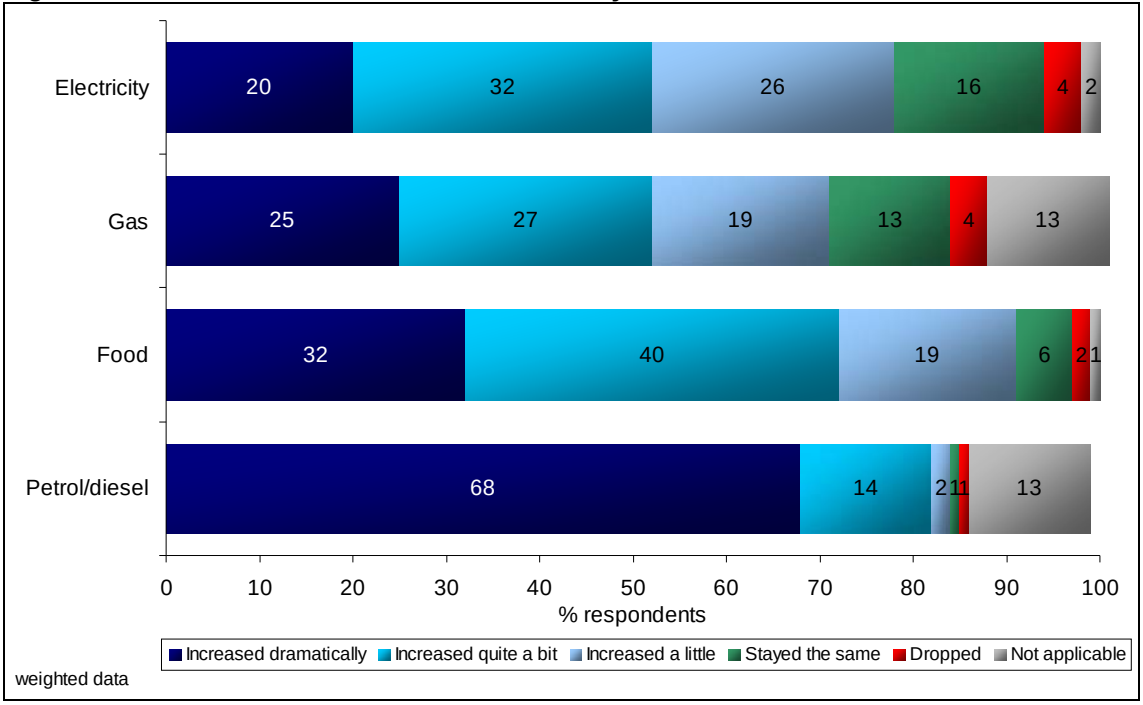
## 4.1 Affordability

**Key Findings**

- Affordability is seen to have been constrained by increases to household bill sizes accompanied by reduced or static incomes over the past two years
- The costs of petrol/diesel have increased dramatically over the past two years, while food, gas and electricity bills have also risen
- Total household incomes have mostly fallen or remained static over the past two years or, if they have risen, have not matched increases to household bills
- Those who have experienced a change in their total household incomes over the last two years mostly think these changes will last at least another two to five years (35%), if not longer (38%)

Respondents say that the cost of petrol/diesel has increased dramatically over the past two years: some two thirds (68%) say this with a further 14% saying it has increased quite a bit. Food bills have also risen, with a third (32%) saying they have increased dramatically and a further 40% saying they have increased quite a bit. More than half of respondents also say that their gas and electricity bills have increased (see Figure 1).

**Figure 1: Increase in household bills in last two years**




Base: 1002

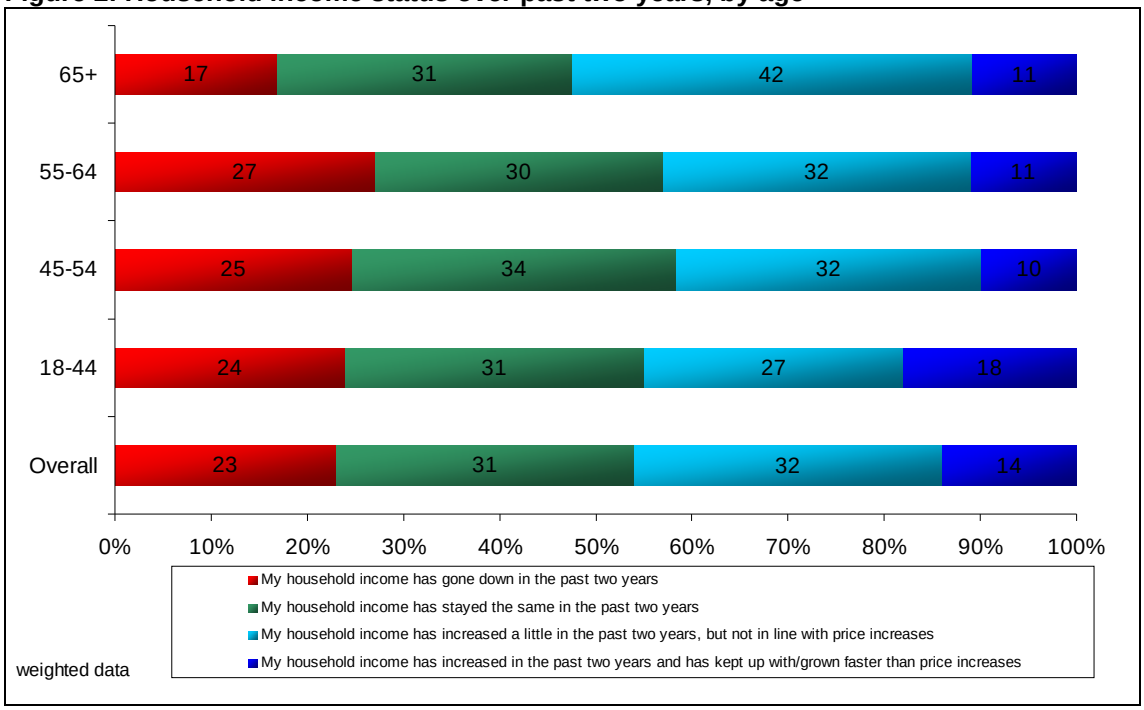
Alongside these increases to household bills, total household incomes (before deductions) have fallen or remained the same over the past two years for 54% of respondents. For a further third (32%) total household incomes have risen over the past two years but not in line with price increases.

Respondents aged 18-44 years are more likely to have experienced an increase in their household incomes that have kept up with or exceeded price increases – 18% compared

with 10% for those aged 45-54 years and 11% for those aged 55 years or more. However even this group contains a large majority who have seen their purchasing power fall in real terms. Respondents in the ABC1 socio-economic group are also more likely to have seen an increase in their income that kept up with or exceeded price increases – 17% compared to 11% in the C2DE group – but again the majority had seen a fall in purchasing power.

Figure 2 shows the details by age.

**Figure 2: Household income status over past two years, by age**

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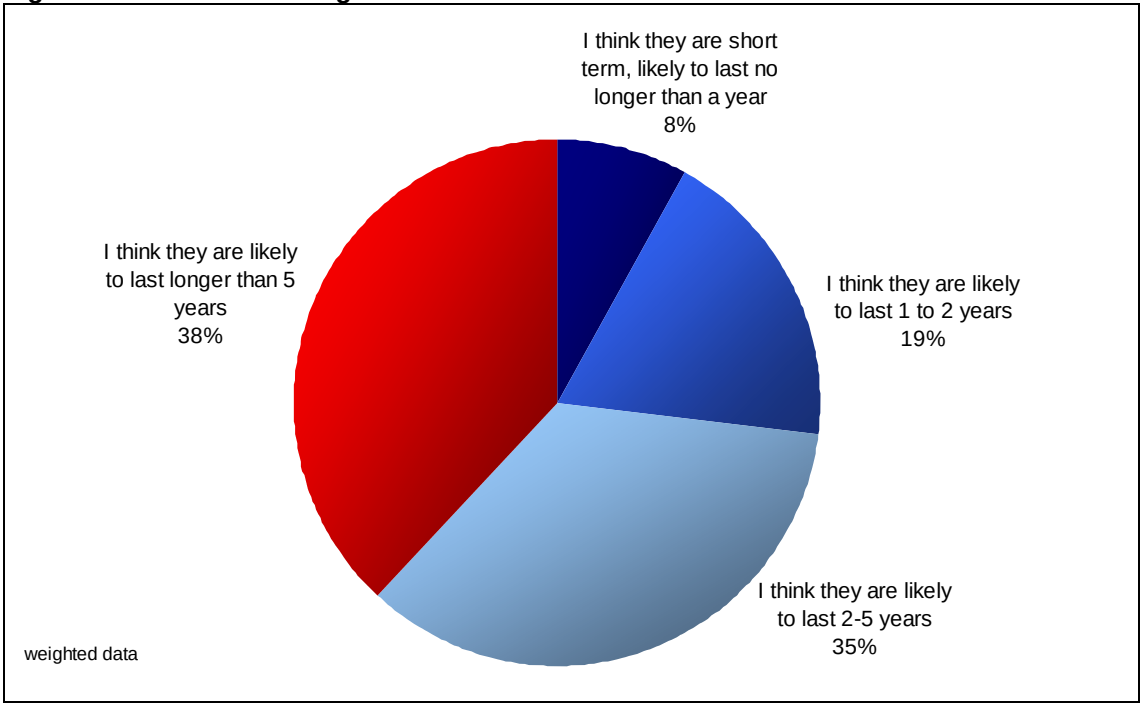
Most respondents who say they have experienced a change in their total household incomes over the last two years think these changes are medium to long term: 35% think they will last at least another two to five years, and 38% think they will last even longer.

**Figure 3: Duration of changes to household income**




Base: those whose household income has changed in past two years – 690

## 4.2 Electricity Bill Size

**Key Findings**

- The average size of the electricity bill is £671 pa, with more than half (56%) paying £500 pa or more
- Most respondents pay their electricity bill monthly (70%) and by direct debit (74%)

Respondents were asked how much their electricity bill is. They were not required to refer to their bill – their perception of their electricity bill size was considered to provide a valid context for subsequent willingness to pay questions.

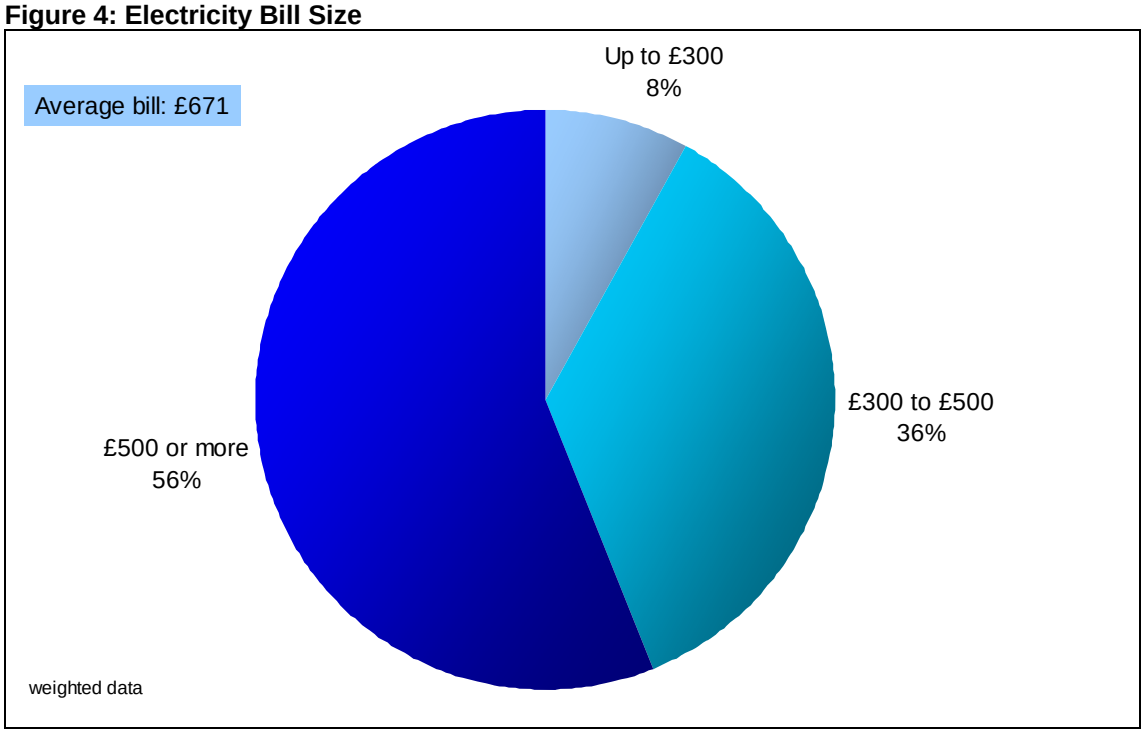
Respondents could give a cost per week, per month or per year and were reminded to adjust for dual fuel bills if necessary. Respondents giving an amount for their electricity bill were asked to say if it was an exact amount or an estimate; 69% of these said they had estimated the amount.

Just 15% did not know the size of their electricity bill. Those who did not know how much they pay for their electricity were told that the average bill is £424 pa (source: Ofgem) and asked if that sounded about right for them. If they did not agree they were invited to suggest an amount for their bill.

More than half of respondents (56%) say their electricity bill is £500 pa or more (see Figure 4); the average size of electricity bill among respondents is £670.86 pa, compared with the average bill size of £424 pa currently published by Ofgem. There are a number of possible explanations for this difference. It may be, for example, that the average bill size has increased since Ofgem published this figure (qualitative participants certainly thought it was unrealistic), or perhaps more customers are now

paying off arrears. It may also be that some respondents who pay dual fuel have not calculated their electricity bill accurately. However, as stated above, it is our view that respondents' perception of their bill size is valid, particularly in the context of other household bills and household income.

**Figure 4: Electricity Bill Size**




Base: 1002

The majority pay their electricity bill monthly (70%) and by direct debit (74%).

## 4.3 Usage of the Countryside

**Key Findings**

- Overall, 2% of respondents say they live in a National Park, and 10% in an AONB or NSA
- Over half (51%) say they live within an hours' drive of an AONB/NSA and a third (37%) within an hours' drive of a National Park
- More than half (52%) of those who do not live in an AONB/NSA visit an AONB/NSA at least three or four times a year with a further 28% visiting at least once or twice a year
- 39% of those who do not live in a National Park visit a National Park at least three or four times a year with a further 32% visiting at least once or twice a year
- Nearly three quarters (72%) of those who live in urban or town and fringe areas visit a non designated rural area at least three or four times a year with a further 11% visiting at least once or twice a year
- The most widely mentioned activities undertaken in designated landscapes and other rural areas were cycling, running and walking; some three quarters (76-77%) gave these activities for AONBs/NSAs and two thirds (67%) gave these activities for other rural areas

## Introduction

Respondents were asked to consider three designated landscapes:

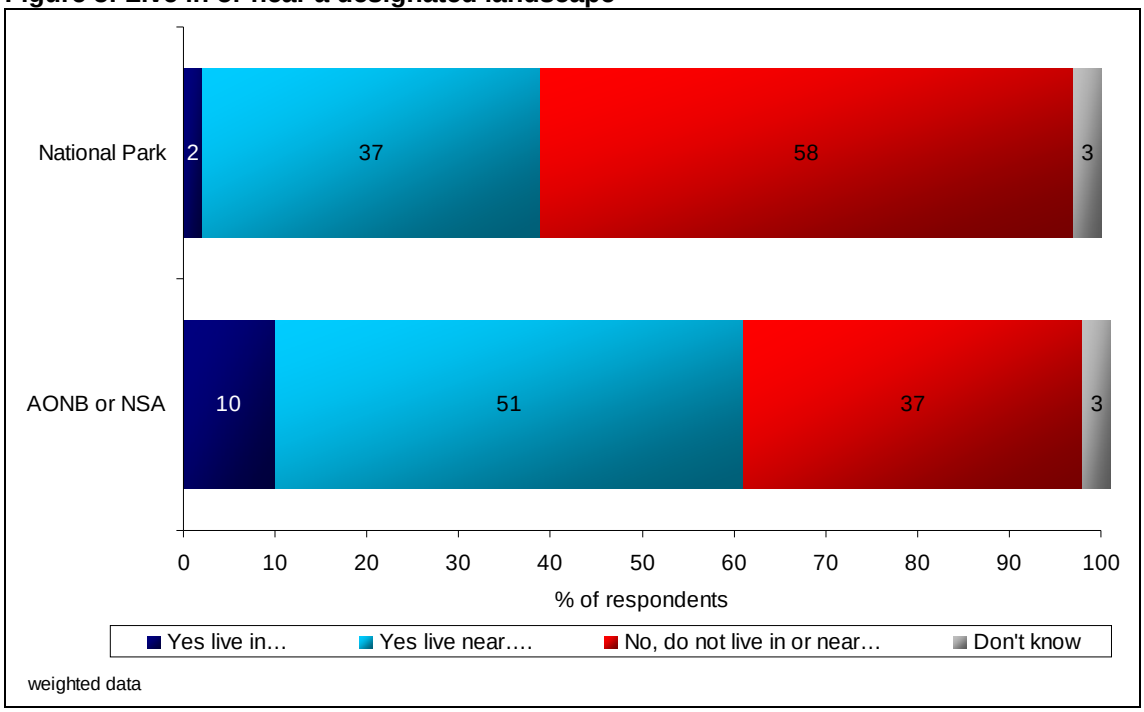
- National Parks
- Areas of Outstanding Natural Beauty (AONBs) – England and Wales only
- National Scenic Areas (NSAs) – Scotland only.

Respondents were given a showcard setting out descriptions and locations of the designated landscapes. The showcard is included in Appendix E to this report.

## Proximity to Designated Landscapes

Overall, 2% of respondents say they live in a National Park and a further 37% live near (within an hour's drive of) one; 10% live in an AONB or NSA and a further 51% live within an hour's drive of one, as Figure 5 shows.

**Figure 5: Live in or near a designated landscape**




Base: 1002

## Frequency of Visiting Designated Landscapes

Of those who do not live in an AONB/NSA, more than half (52%) visit an AONB/NSA at least three or four times a year with a further 28% visiting at least once or twice a year.

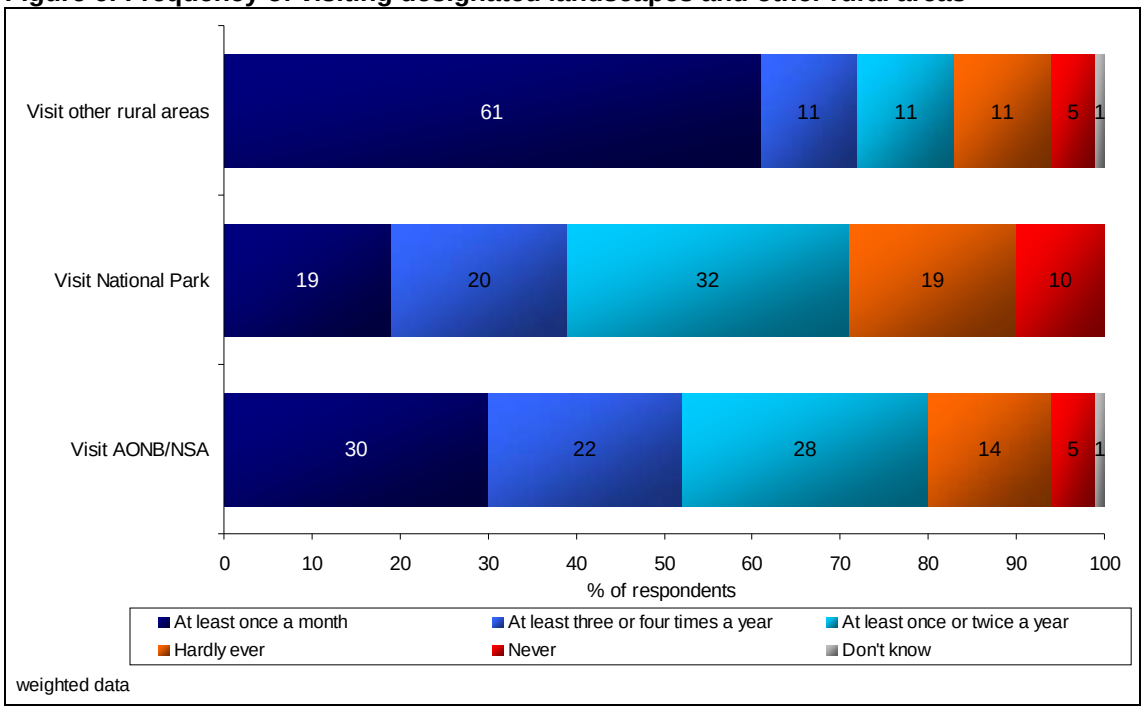
Of those who do not live in a National Park, two fifths (39%) visit a National Park at least three or four times a year with a further third (32%) visiting at least once or twice a year.

Of those who live in urban or town and fringe areas, nearly three quarters (72%) visit a non designated rural area at least three or four times a year with a further 11% visiting at least once or twice a year.

A fifth (19%) visits an AONB/NSA hardly ever or never; 29% visit a National Park hardly ever or never; 16% visit another rural area hardly ever or never.

Figure 6 shows the detail.

**Figure 6: Frequency of visiting designated landscapes and other rural areas**

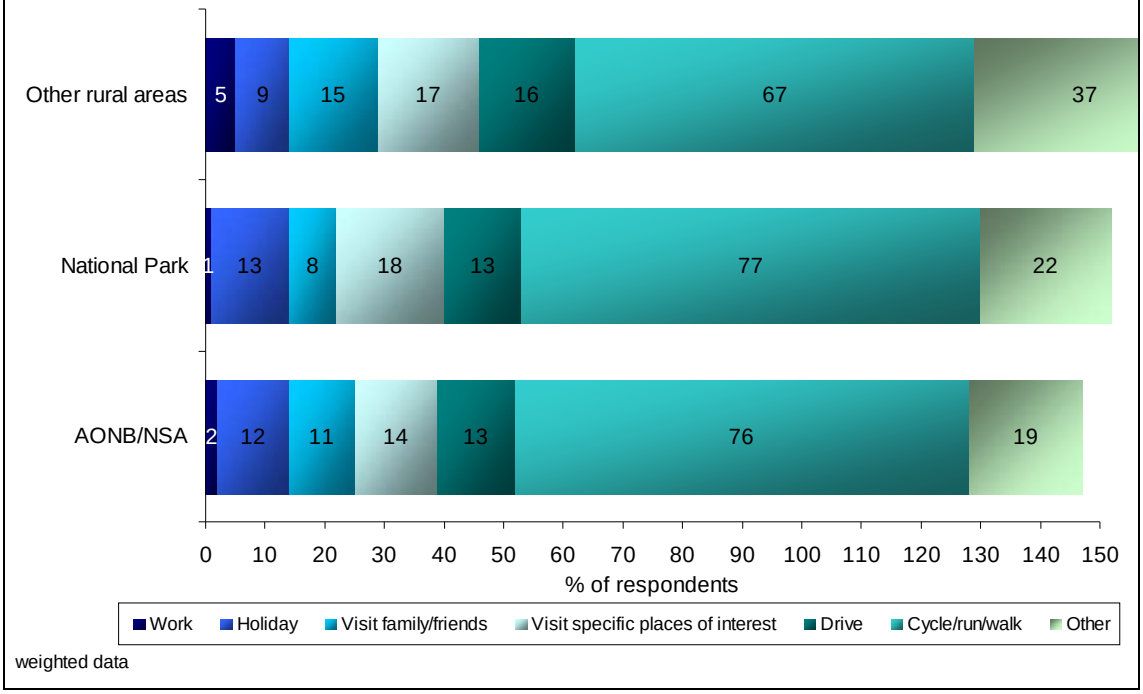



Base: those not living designated areas
AONB/NSA – 902; National Park – 983; other rural area – 887

## Activities in Designated or Other Rural Areas

The most widely mentioned activities undertaken in designated landscapes and other rural areas are cycling, running and walking; some three quarters (76-77%) give these activities for AONBs/NSAs and two thirds (67%) give these activities for other rural areas. Figure 7 shows the detail.

**Figure 7: Activities undertaken in designated and other rural areas**




Base: those who live outside and visit…
AONB/NSA 725; National Park 690; Other rural area: 742

## 4.4 Attitudes to Electricity Transmission Infrastructure

**Key Findings**

- Electricity transmission infrastructure is considered to be 'necessary and unavoidable' by 62% of respondents
- However, it is also considered to be 'ugly and an eyesore' by 55% of respondents
- Two fifths neither feel strongly about electricity transmission infrastructure (41%) nor notice it (42%)
- One third (32%) consider electricity transmission infrastructure to be industrial architecture/ heritage
- While there are some small differences in strength of attitudes by subgroup, overall the pattern of attitudes is very similar across age groups, location of residence, usage of the landscape and proximity to electricity infrastructure.
- Those who live in or near a designated area are a little more likely to disagree that the infrastructure is ugly and an eyesore
- Respondents who cannot see any transmission infrastructure from their home are slightly more likely than other respondents to consider it ugly and an eyesore
- The younger (18-44) respondents are more likely to agree that the infrastructure is

necessary and unavoidable (71% of this group agree compared to 62% overall)

- Respondents aged 65+ years are more likely than other age groups to agree that they do not feel strongly about transmission infrastructure in the countryside
- The older age group (65+ years) is more likely than other age groups to agree that transmission infrastructure is industrial architecture/heritage; 45-54 year olds are more likely to disagree with this statement

## Introduction

Respondents were presented with five attitudinal statements regarding electricity transmission infrastructure in the countryside and asked to say how strongly they agreed with each:

- it is necessary and unavoidable
- it is ugly and an eyesore
- I don't feel strongly about it
- I really don't notice it
- it is industrial architecture/heritage.

## Overall

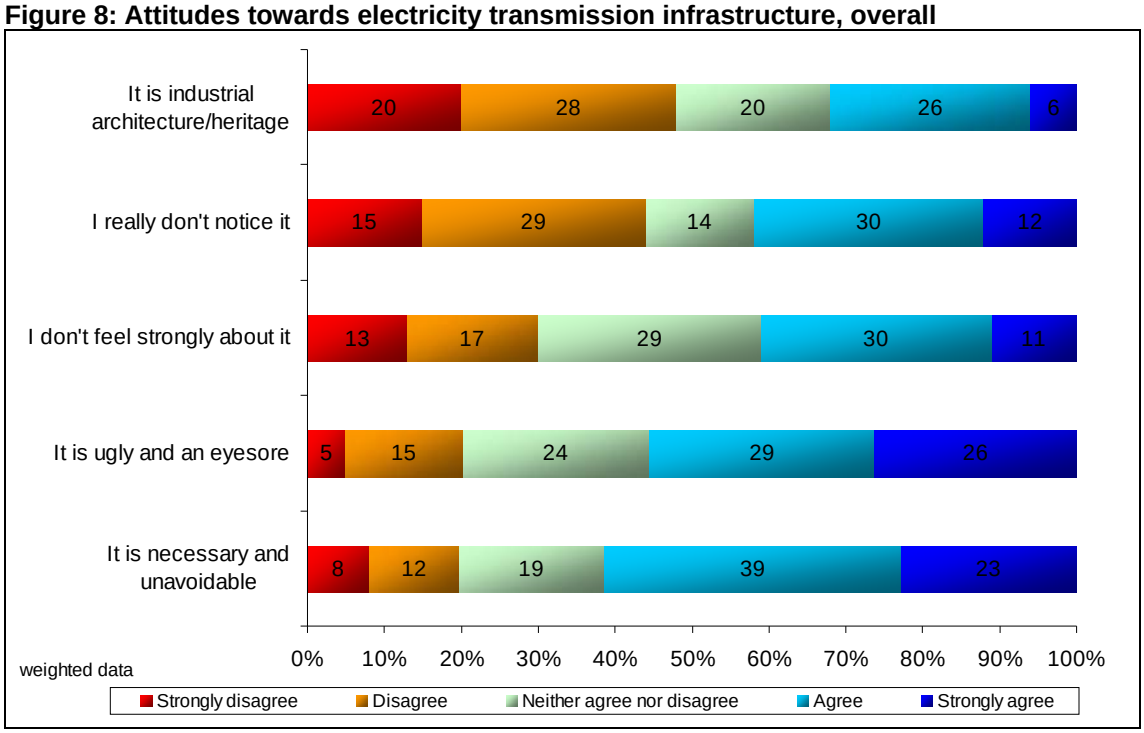
Respondents largely consider electricity transmission infrastructure to be necessary and unavoidable; 62% of respondents agree with this statement, as Figure 8 shows. At the same time, 55% of respondents agree that electricity transmission infrastructure is ugly and an eyesore.

Some two fifths overall do not feel strongly about electricity transmission infrastructure (41%) or do not notice it (42%).

Just a third (32%) consider electricity transmission infrastructure to be industrial architecture/ heritage.

There are some small differences in strength of attitudes by subgroups which are described in detail below. Overall, however, attitudes to infrastructure are similar across age groups, location of residence, usage of designated landscapes and proximity to electricity infrastructure.

**Figure 8: Attitudes towards electricity transmission infrastructure, overall**

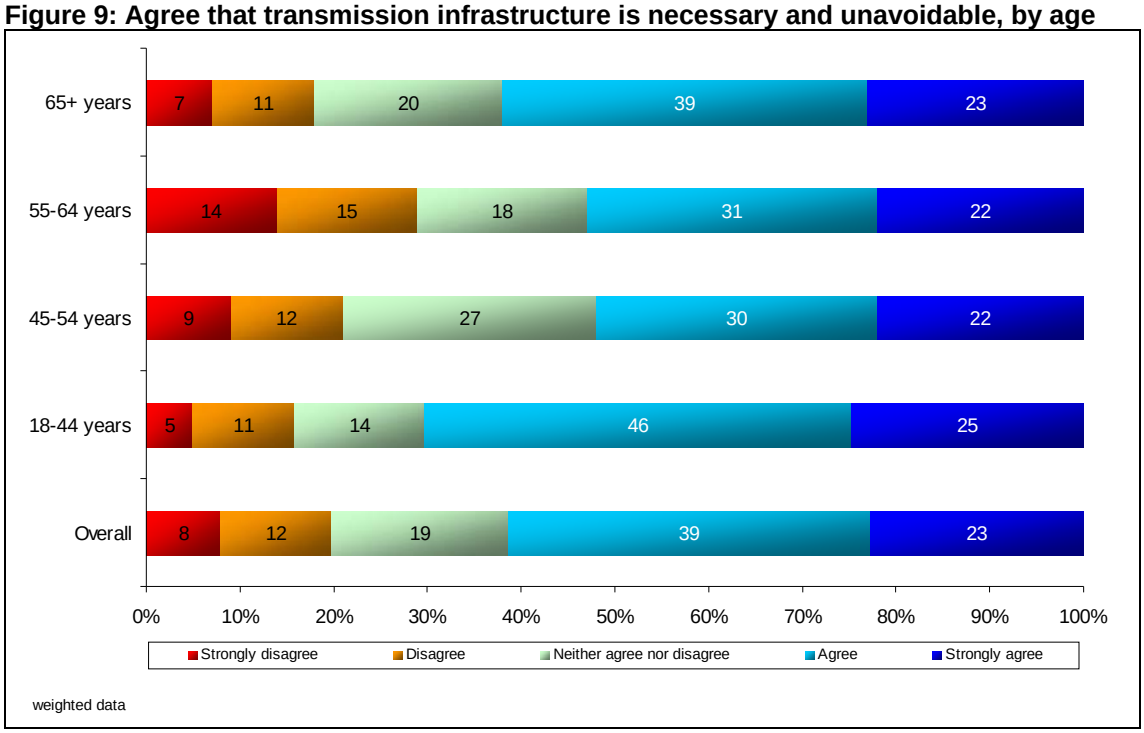



Base: 1002

## Transmission Infrastructure is Necessary and Unavoidable

Those aged 18-44 years are more likely than other age groups to agree that transmission infrastructure is necessary and unavoidable; 71% of 18-44 year olds agree with this statement compared with 62% overall as Figure 9 shows.

**Figure 9: Agree that transmission infrastructure is necessary and unavoidable, by age**



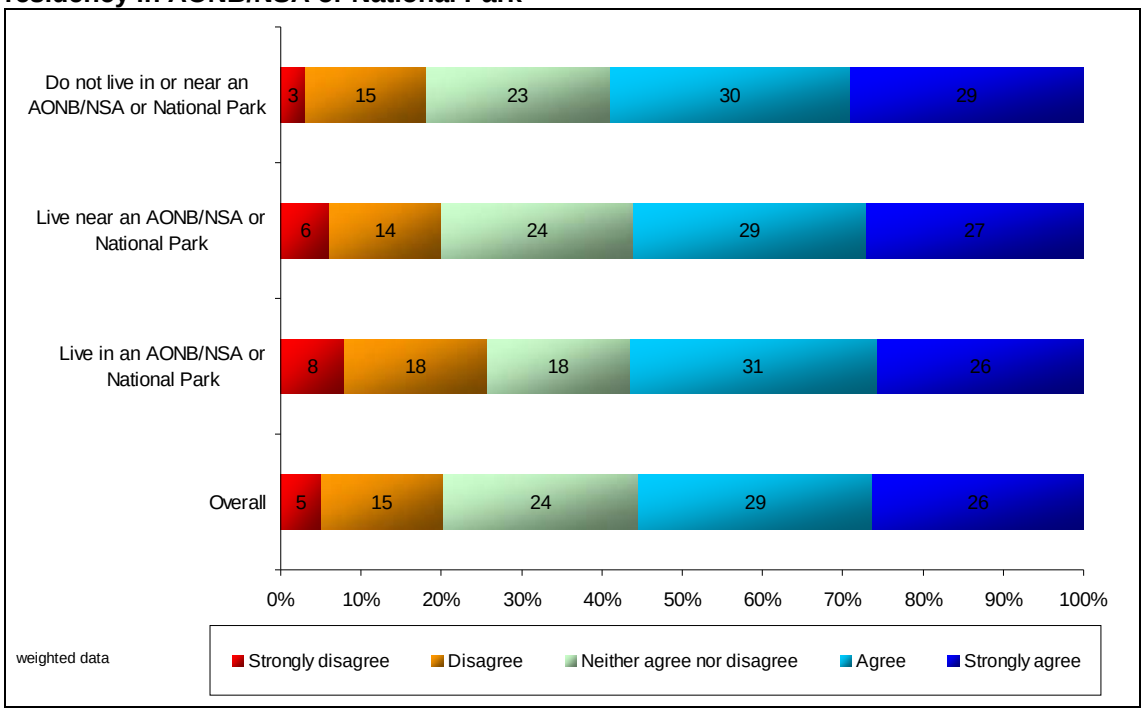

Base: 1002

## Transmission Infrastructure is Ugly and an Eyesore

Those who live in or near a designated area are a little more likely than other respondents to disagree that the infrastructure is ugly and eyesore.

Eight per cent of those who live in and 6% of those who live near an AONB/NSA or National Park strongly disagree that the infrastructure is ugly and an eyesore; although small, these proportions are both significantly higher than the 3% of those who do not live or near an AONB/NSA or National Park who strongly disagree with this statement (see Figure 10).

**Figure 10: Agreement that transmission infrastructure is ugly and an eyesore, by residency in AONB/NSA or National Park**




Base: 1002

Respondents who can see transmission infrastructure from their home are a little less likely to consider it ugly and an eyesore.

Seven per cent each of those who can see transmission infrastructure from their home or from their neighbourhood strongly disagree that the infrastructure is ugly and an eyesore; these proportions are both significantly higher than the 2% of those who cannot see any infrastructure and who strongly disagree with this statement (see Figure 11).

Similarly, 33% of those who cannot see any infrastructure from their home or in their neighbourhood agree that the infrastructure is ugly and an eyesore (and 28% strongly agree). This proportion is significantly greater than the 24% of those who can see infrastructure from their neighbourhood and who agree that it is ugly and an eyesore (plus 24% who strongly agree).

**Figure 11: Agreement that transmission infrastructure is ugly and an eyesore, by visibility of infrastructure from home**

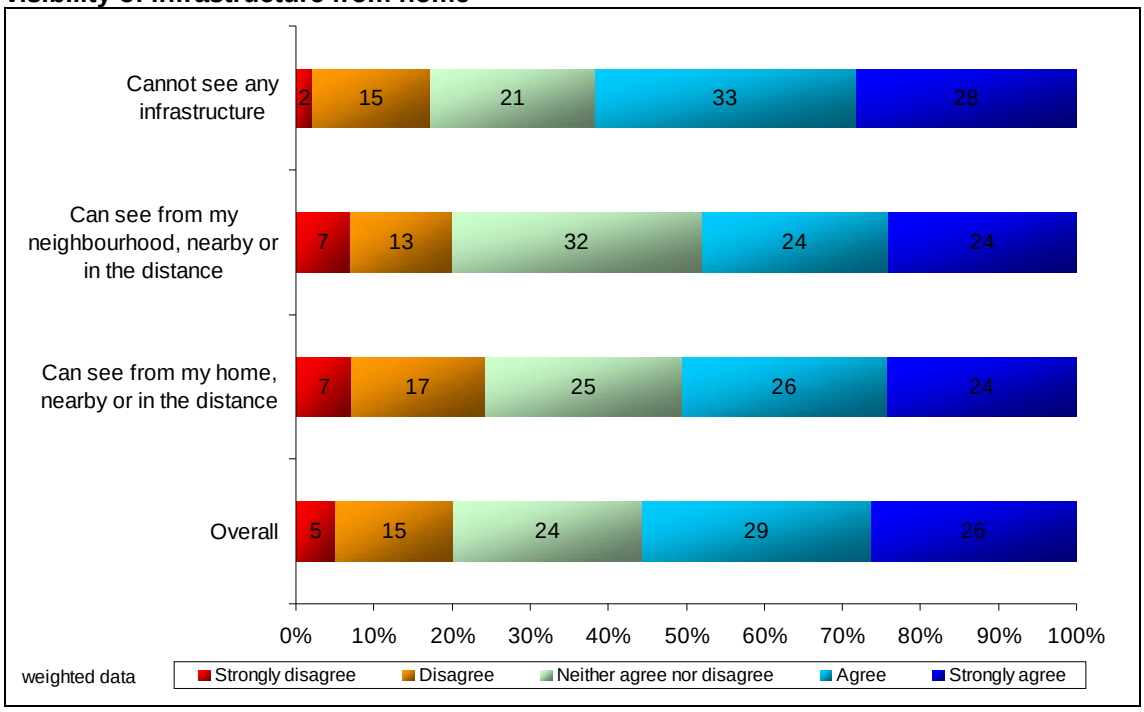



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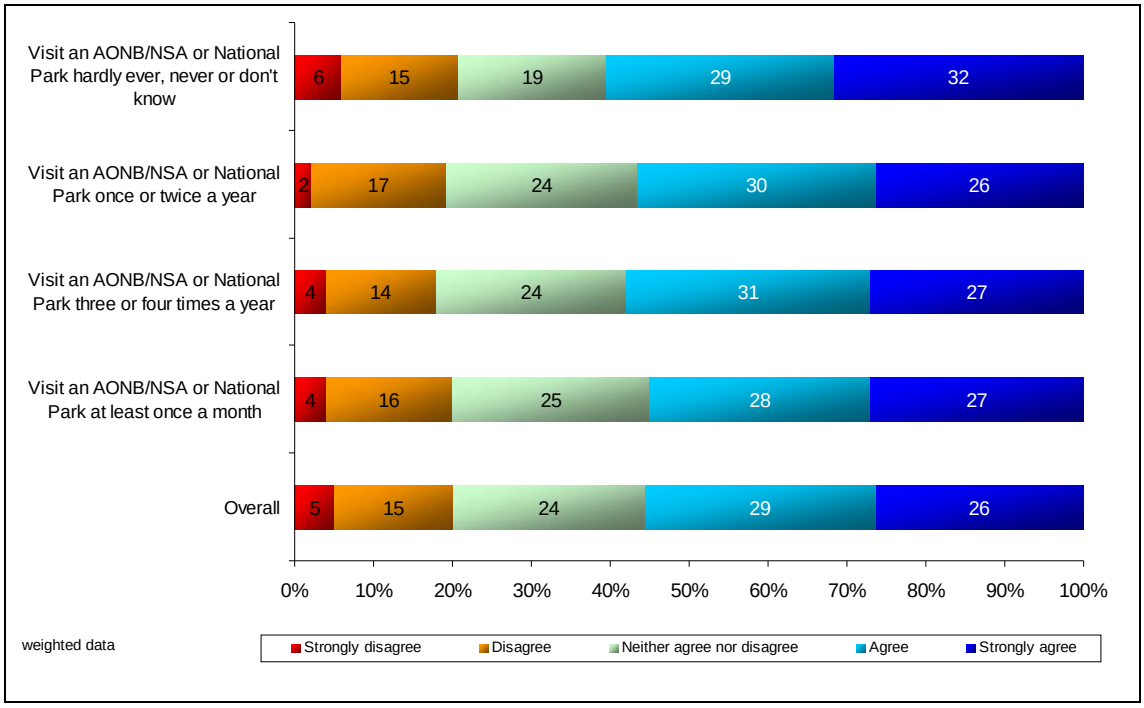
Figure 12 shows the level of agreement with the statement that infrastructure is ugly and an eyesore by frequency of visiting AONBs/NSAs or National Parks. There are no significant differences between more frequent and less frequent visitors in terms of views on this measure.

**Figure 12: Agree that infrastructure is ugly and an eyesore, by frequency of visiting AONBs/NSAs or National Parks**



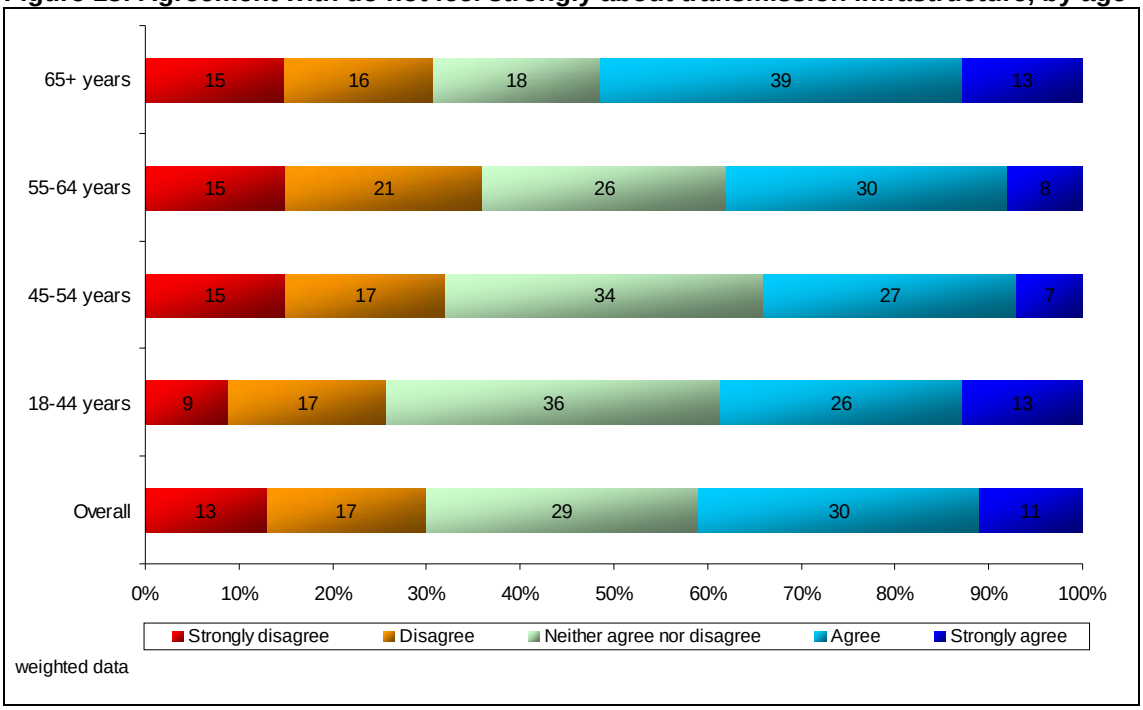

Base: 1002

## Do Not Feel Strongly About Infrastructure

Respondents aged 65+ years are more likely than other age groups to agree that they do not feel strongly about transmission infrastructure in the countryside: half (52%) agree with this statement, as Figure 13 shows.

Respondents aged 45-54 years are least likely to agree with this statement – just 34% agree that they do not feel strongly about transmission infrastructure.

**Figure 13: Agreement with do not feel strongly about transmission infrastructure, by age**



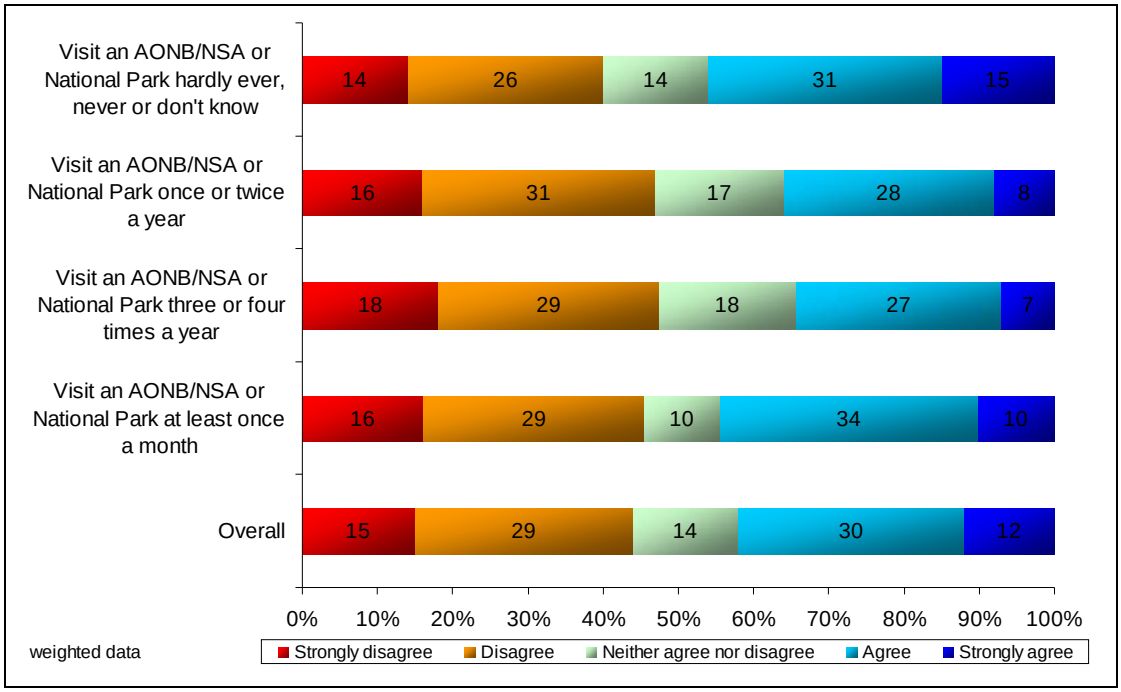

Base: 1002

## Do Not Notice Infrastructure

Respondents who never, or hardly ever, visit an AONB/NSA or a National Park are more likely to say they do not notice the infrastructure (15% strongly agree compared to 12% overall).

Figure 14 shows the level of agreement with the statement that one does not notice the infrastructure, by frequency of visiting AONBs/NSAs or National Parks.

**Figure 14: Agree that do not notice infrastructure, by frequency of visiting AONBs/NSAs or National Parks**

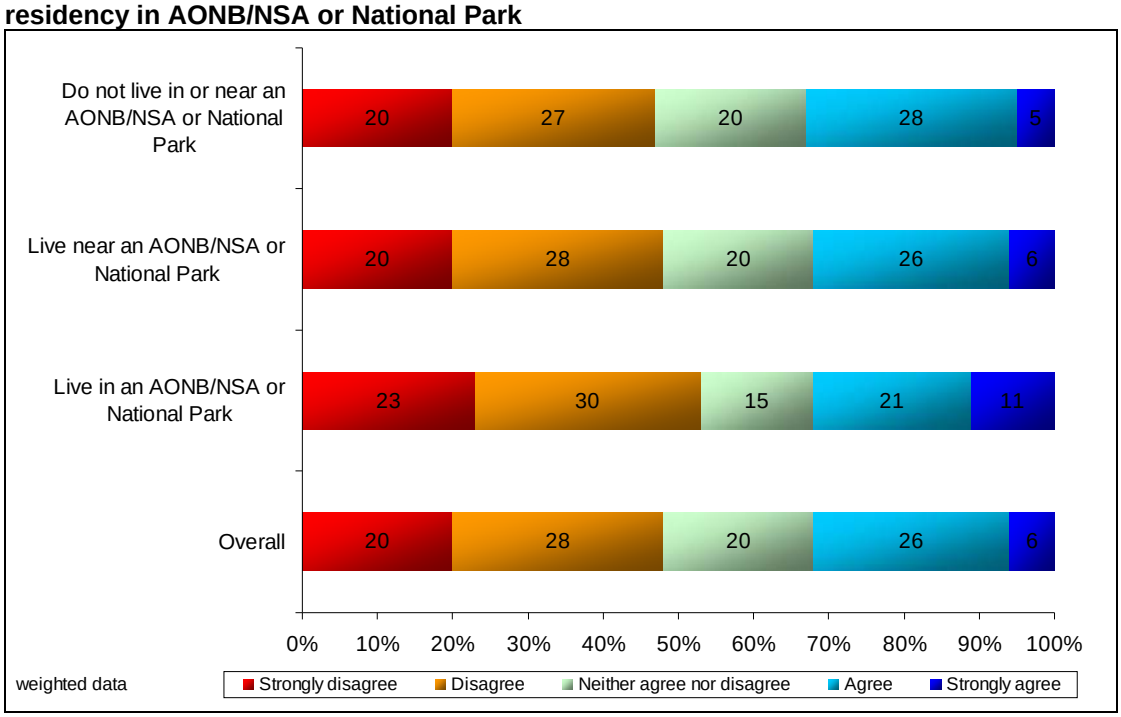



Base: 1002

## Transmission Infrastructure is Industrial Architecture/Heritage

Respondents who live in an AONB/NSA or National Park have slightly more polarised views on the statement that transmission infrastructure is industrial architecture/heritage; 11% strongly agree with this statement compared with 6% overall, but the number who disagree is also higher than other groups (though this latter difference is not statistically significant) (see Figure 15).

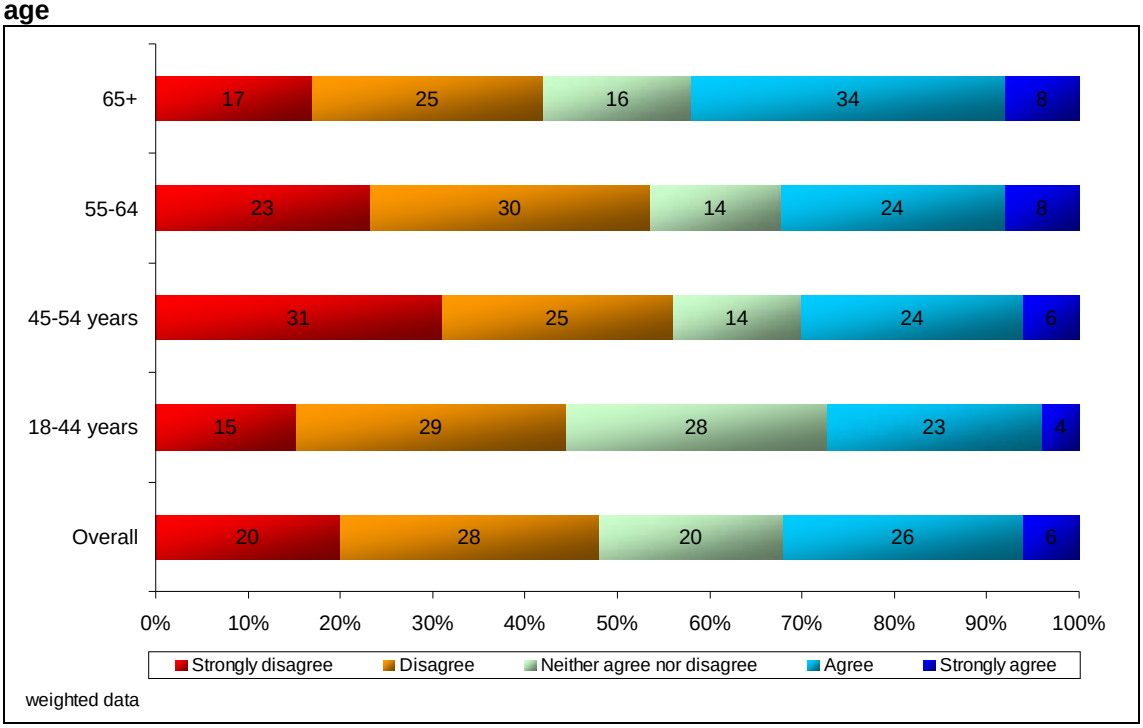
**Figure 15: Agree that transmission infrastructure is industrial architecture/heritage, by residency in AONB/NSA or National Park**




Base: 1002

The older age group (65+ years) is more likely than other age groups to agree that transmission infrastructure is industrial architecture/heritage; 42% agree with this statement compared to 32% of 55-64 year olds, 30% of 45-54 year olds and 27% of 18-44 year olds (see Figure 16). 45-54 year olds are more likely to strongly disagree with this statement.

**Figure 16: Agree that transmission infrastructure is industrial architecture/heritage, by age**

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## 4.5 Preference for Mitigation Method

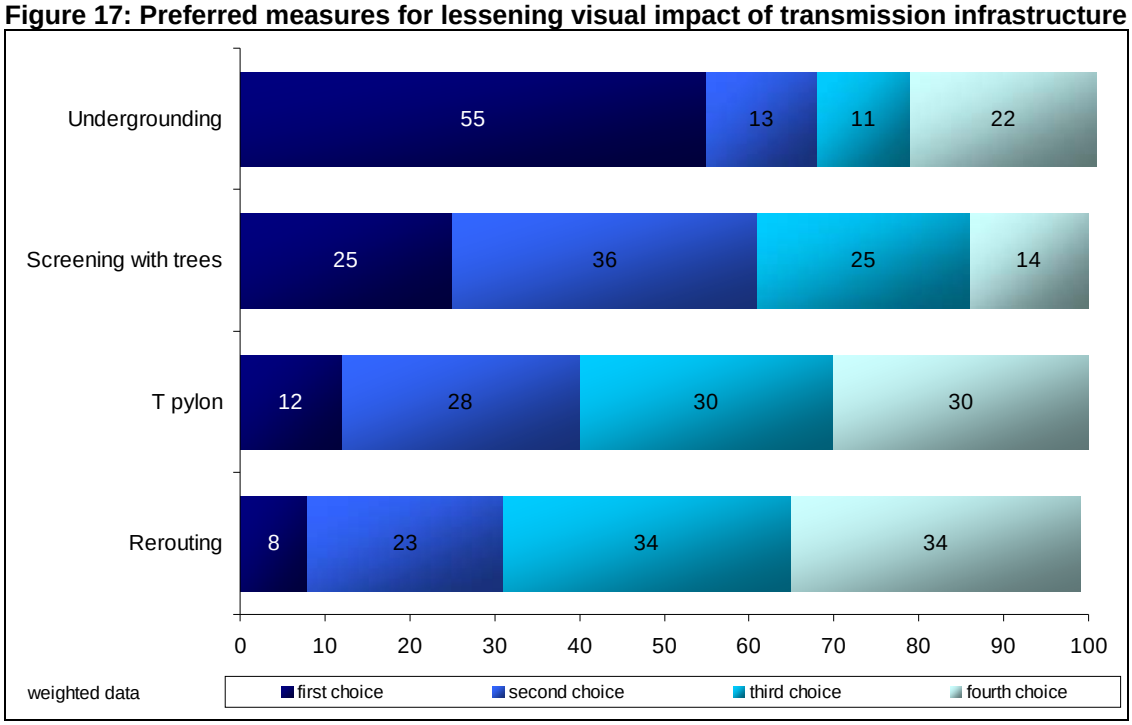
**Key Findings**

- In a straightforward ranking question, undergrounding is the first choice for more than half (55%) of respondents as a method for lessening the visual impact of transmission infrastructure on the countryside. Nearly a quarter (22%) place undergrounding last in their order of priorities
- A quarter (25%) give screening with trees as their first choice and 12% prefer the new T-pylon
- Preference for mitigation method is consistent across location of residence and frequency of use of designated landscapes
- Those who can see pylons from their home are slightly more likely than others to place screening with trees in first place

As an introduction to the various mitigation methods, the questionnaire described the four methods under consideration (undergrounding, screening with trees, replacement with T-pylon and rerouting) and asked respondents to consider how they would rank the four methods in order of preference. The principal purpose of this question was as an education for the respondent. Respondents' preferences for mitigation method are a main outcome from the stated preference model; however the straightforward ranking data is also shown here for comparison purposes.

Undergrounding is the favoured measure for lessening the visual impact of transmission infrastructure on the countryside for more than half (55%) of respondents. A quarter (25%) favour screening with trees and just 12% say the new T-pylon is their preferred measure.

**Figure 17: Preferred measures for lessening visual impact of transmission infrastructure**

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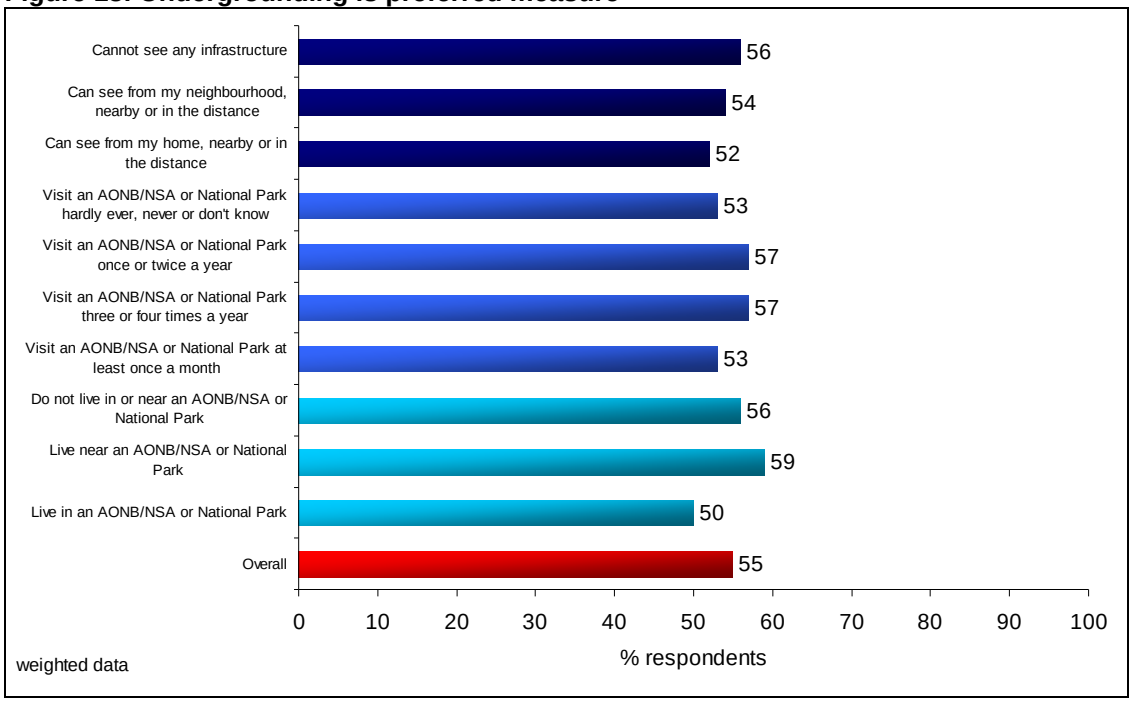
There is very little difference in preference for mitigation measure by location, proximity to designated landscapes, use of the countryside, or proximity to infrastructure. Figure 18 shows the proportions saying that undergrounding would be their first choice; there are no significant differences between groups.

**Figure 18: Undergrounding is preferred measure**

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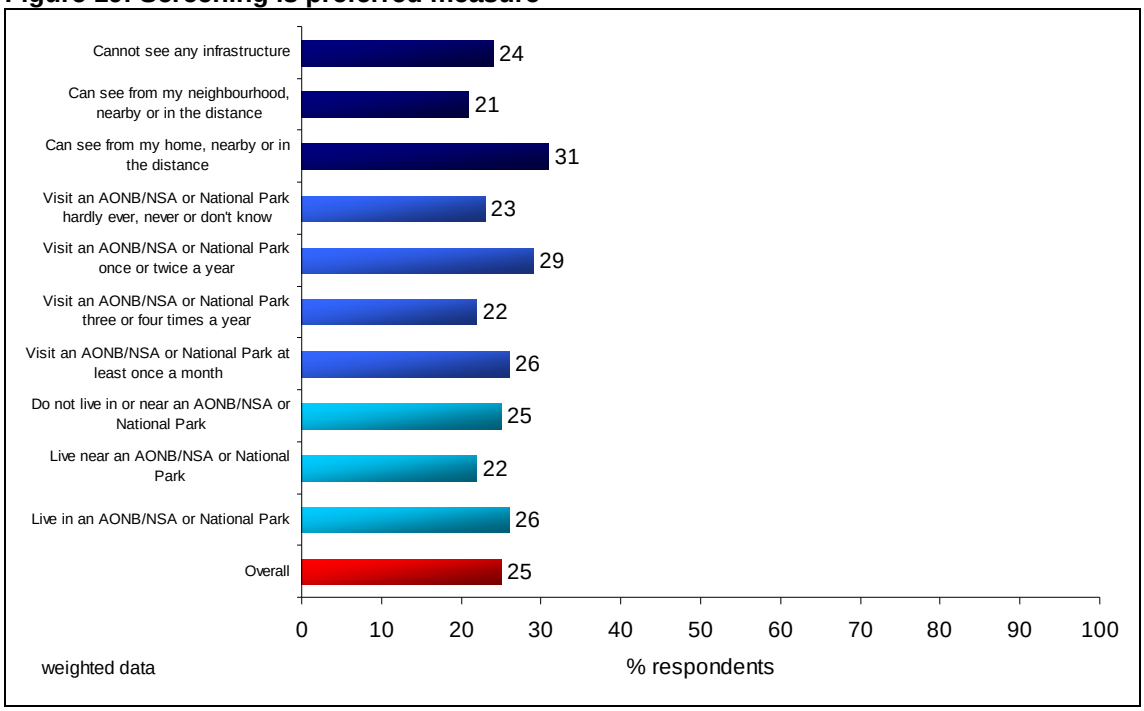
Screening with trees is the preferred measure for 31% of those who can see infrastructure from their home, significantly higher than for other groups. Figure 18 shows the proportions saying that screening would be their first choice.

**Figure 19: Screening is preferred measure**

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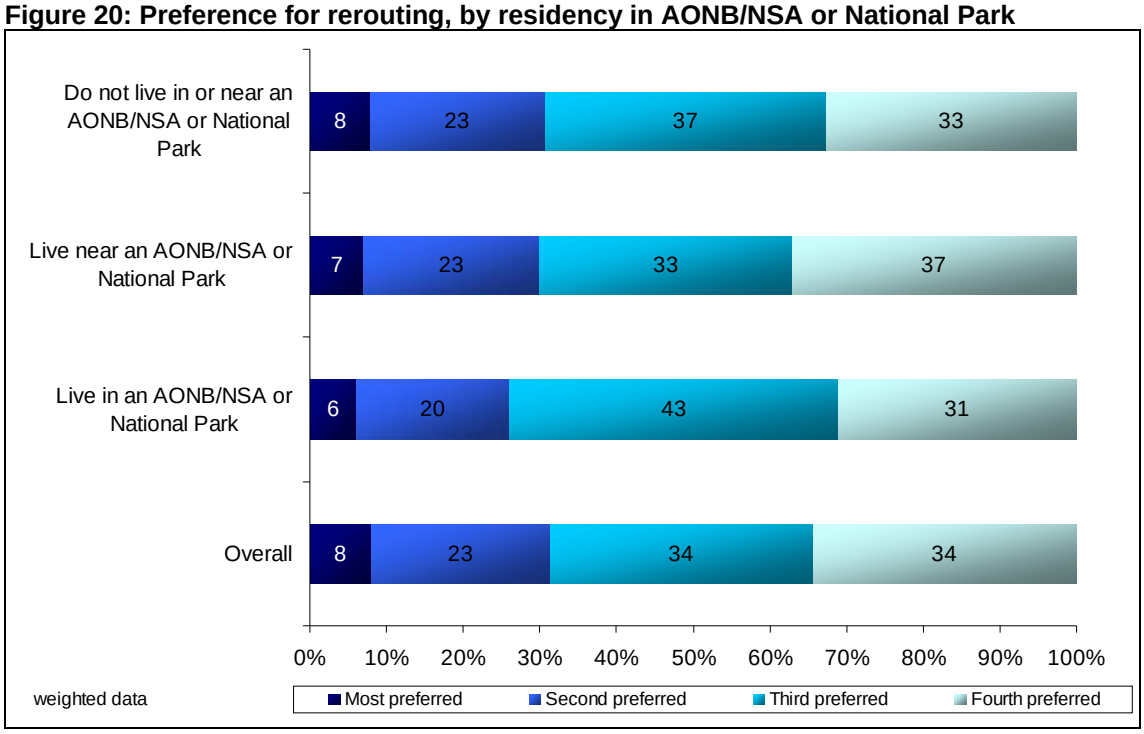
Rerouting is the least popular choice for mitigation method, even among those who live in a designated landscape.

**Figure 20: Preference for rerouting, by residency in AONB/NSA or National Park**

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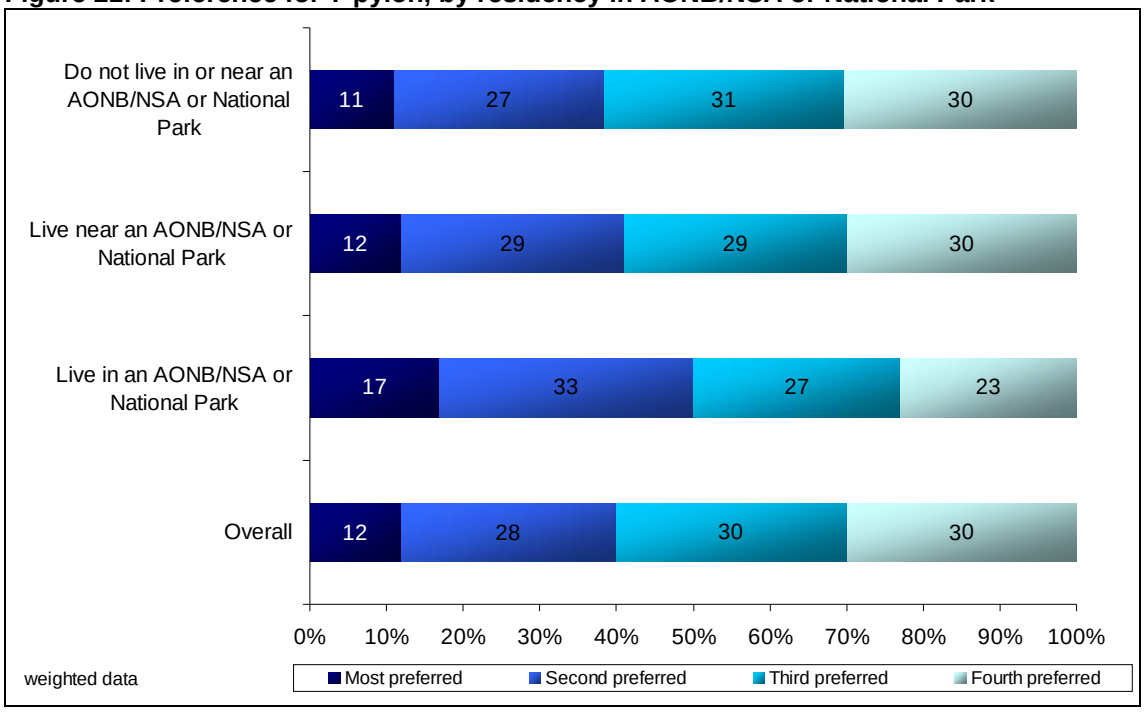
The T-pylon is also chosen by relatively few. Those who live in an AONB/NSA or National Park favour the T-pylon a little more than other groups but this difference is not statistically significant.

**Figure 21: Preference for T-pylon, by residency in AONB/NSA or National Park**

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## 4.6 Consumers' Willingness to Pay

**Key Findings**

- The estimated order of benefits from mitigation types places undergrounding at the top, followed by or on-par with screening, and followed by T-pylons, which is in turn followed by rerouting
- Short length mitigation projects of 5 and 10 miles show significant sensitivity to neither location nor length. However, the relative ranking of mitigation types is consistent with that observed in larger projects, with undergrounding producing an estimated benefit of £13.40 per household per annum, screening of £8.65, T-pylons of £1.75 and re-routing of £0.70
- For programmes of 20 miles, consumers are more sensitive to location. For a programme of 20 miles in AONBs/NSAs they are willing to pay more than for the same programme in National Parks or other rural areas. WTP for undergrounding 20 miles of infrastructure in AONBs/NSAs rises to £16.27. WTP for a programme of other mitigation measures in AONBs/NSAs also increased with the measures remaining in the same order and proportion as before
- The scenario with the highest WTP is a 50 mile programme of undergrounding in AONBs/NSAs. Consumers are willing to pay an additional £20.33 per annum to achieve this level of mitigation. The value of a similar programme in National Parks is not significantly different, at £19.84. Values for all measures in other rural areas are also increased at 50 miles, but to a lesser extent
- Approximately 20% of respondents had a zero WTP. These were not drawn from any particular income or socio-economic group. Those who refuse to pay are both less likely to see the need for mitigation, and to say they have economic constraints to paying more

Benefits were estimated by administering a choice experiment to a representative sample of 1,002 respondents using best-worst ranking of four alternatives arranged in four choice sets for respondents. This gives rise to twelve choices per respondent which were analysed using logit models specified in the WTP-space. (The analysis method and model specifications are included in Appendix G.) The estimated coefficients identified effects for all categories of choice attributes which together provided information for the estimation of the benefits associated with 48 mitigation scenarios.

These are shown in Table 4.

**Table 4: Inferred WTP estimates for different mitigation scenarios from choice data (£ per household per year for 8 years)**

| Measure | Location | | |
|---|---|---|---|
| | in other rural areas | in National Parks | in AONBs/NSAs |
| **at least 5 miles** | | | |
| T-pylons | 1.75 | 1.75 | 1.75 |
| rerouting | 0.70 | 0.70 | 0.70 |
| screening | 8.65 | 8.65 | 8.65 |
| undergrounding | 13.40 | 13.40 | 13.40 |
| **at least 10 miles** | | | |
| T-pylons | 1.75 | 1.75 | 1.75 |
| rerouting | 0.70 | 0.70 | 0.70 |
| screening | 8.65 | 8.65 | 8.65 |
| undergrounding | 13.40 | 13.40 | 13.40 |
| **at least 20miles** | | | |
| T-pylons | 1.75 | 1.75 | 4.62 |
| rerouting | 0.70 | 0.70 | 3.57 |
| screening | 8.65 | 8.65 | 11.52 |
| undergrounding | 13.40 | 13.40 | 16.27 |
| **at least 50 miles** | | | |
| T-pylons | 3.16 | 5.54 | 6.03 |
| rerouting | 2.11 | 4.49 | 4.98 |
| screening | 10.06 | 12.44 | 12.93 |
| undergrounding | 14.81 | 19.84 | 20.33 |

Moving from the top block of four rows to the bottom block the estimates refer to increasingly long tracts of mitigation (5 miles, 10 miles, 20 miles and 50 miles). From top to bottom benefit estimates are expected to increase by block. Within each block moving from the left column (other rural areas) to the middle one (National Parks) and to the right one (AONBs) the benefits from mitigation values vary by location. Finally moving from top rows down to the bottom within each block the estimates vary by mitigation measures. Benefit estimates are expressed in additional pounds per household added to the annual bill for the duration of the programme (8 years).

Across mitigation types undergrounding is valued most, followed by screening and then by T-pylons, with re-routing least valued. Estimates are significantly different across mitigation measures, except for those between pylons and rerouting. Across locations the benefit increase via interaction effects with length and locations (eg 20 miles and AONBs/NSAs) and with mitigation-specific effects at some length (eg undergrounding at 50 miles).

Focusing on the top block, which relates to a tract of 5 miles, the model predicts that undergrounding and screening are the most valued with point estimates of £13.40 and £8.65. T-pylons are valued at a distant £1.75 and rerouting at less than a pound (£0.70). These benefit estimates are not sensitive to the first distance class of 10 miles across the three locations. The first increase is noticed for AONBs/NSAs at 20 miles, while at 50 miles there is a jump in estimates across all locations, with the strongest increase experienced by mitigation in National Parks and AONBs/NSAs, but there is no statistical difference across the point estimates of the two locations (ie the differences in values are likely to be due to sampling error).

For engineering purposes one might be tempted to use these estimates to derive per mileage benefits arising from the mitigation of transmission power lines. So, for example, in National Parks, the same benefit is estimated for undergrounding up to 50 miles. This implies that for two sets of increases in length there is no sensitivity to scope.

The per mile benefit estimate at the 49$^{th}$ mile is £13.4/49 = £0.27. This jumps to £0.37 at the 50$^{th}$ mile. In terms of computing benefits a per mile computation is unlikely to have been the thought process respondents generally undertook in evaluating the impact of mitigation of visual intrusion. It would appear more appropriate to assign these values to categories of mitigation project spanning those distances. For 50 mile projects benefits in National Parks and in AONBs are worth between 75% and 90% more than in other rural areas for T-pylons; between 113% and 136% more for re-routing; between 23% and 28% more for screening; and between 34% and 37% more for undergrounding. So, given a mitigation measure, the strongest relative effect of location on benefits is observed for re-routing, followed by T-pylons, whereas the location effects given the other mitigation measures at this length of intervention are not large in relative terms.

At lengths of 20 miles the location with strongest benefits are AONBs/NSAs for both re-routing (more than 5 times those of other locations) and T-pylons (2.6 times), while the effects over screening and undergrounding remains minor, respectively 33% and 21% more.

## Hypothetical Bias and Scaling of Values

The figures quoted here are estimates of population means as derived from a choice model based on a systematic sample of hypothetical statements implying a WTP. The key word here is “hypothetical”. Like all hypothetical statements (eg surveys on voting intentions) they suffer from “hypothetical bias”, that is, a difference between the stated WTP and actual WTP as would be observed in a market. The (disputed) assumption is that estimates from stated intentions systematically inflate values. To overcome this a calibration or scaling factor is often used, which would be a number between 0 and 1 by which an estimate of WTP from stated intentions needs to be multiplied to obtain the true WTP one would observe in a market.

The choice of what calibration factor to use to correct for hypothetical bias in the SP estimates reported here may be a controversial one, especially because the existing evidence from specific research is mixed, particularly for marginal WTP estimates from choice experiments, as eloquently reported in Hensher (2010). It cannot, however, be neglected. One meta-analysis study (Murphy et al. 2004) analysed 28 CVM studies that

elicited both real and hypothetical WTP for 83 observations. They find a median ratio of hypothetical to real of 1.35, which implies a calibration factor of 0.74. Since in the present study most of the prescribed precautions to limit such bias were taken (eg inclusion of the status quo as an alternative, budget constraint reminder, etc) it is suggested that this calibration factor be relatively small. Adopting the median of the distribution of ratios from Murphy et al. (2004) seems a good precautionary measure when conducting a sensitivity analysis on the benefit-cost ratios of projects.

The estimates scaled using a factor of 0.74 are shown in Table 5 below.

**Table 5: Inferred WTP estimates for different mitigation scenarios from choice data (£ per household per year for 8 years) – scaled**

| Measure | Location | | |
|---|---|---|---|
| | in other rural areas | in National Parks | in AONBs/NSAs |
| **at least 5 miles** | | | |
| T-pylons | 1.30 | 1.30 | 1.30 |
| Rerouting | 0.52 | 0.52 | 0.52 |
| Screening | 6.40 | 6.40 | 6.40 |
| undergrounding | 9.92 | 9.92 | 9.92 |
| **at least 10 miles** | | | |
| T-pylons | 1.30 | 1.30 | 1.30 |
| Rerouting | 0.52 | 0.52 | 0.52 |
| Screening | 6.40 | 6.40 | 6.40 |
| undergrounding | 9.92 | 9.92 | 9.92 |
| **at least 20miles** | | | |
| T-pylons | 1.30 | 1.30 | 3.42 |
| Rerouting | 0.52 | 0.52 | 2.64 |
| Screening | 6.40 | 6.40 | 8.52 |
| undergrounding | 9.92 | 9.92 | 12.04 |
| **at least 50 miles** | | | |
| T-pylons | 2.34 | 4.10 | 4.46 |
| Rerouting | 1.56 | 3.32 | 3.69 |
| Screening | 7.44 | 9.21 | 9.57 |
| undergrounding | 10.96 | 14.68 | 15.04 |

For purposes of sensitivity testing, however, rather than using the model to derive point estimates of WTP, and to further take care to caution against the potential over-estimation of benefits, one can use lower bound point estimates from an adequately computed cautionary confidence interval.

The ‘sensitivity’ estimates computed through this approach are set out in Table 3 of Appendix G.

## Serial Non Participation and Zero WTP Behaviour

A number of respondents engaged in a non-participatory behaviour (n=224) which, once re-weighted, accounted for 215 or 21.46 per cent of the 1002 respondents in the sample, which is consistent with being willing to pay nothing extra for power line mitigation. This is half the frequency reported in Figure 4 page 6 of the Brunswick report. This might be due to the indirect way by which monetary valuations are

achieved with the choice experiment approach. In fact, with this approach, respondents are asked to make trade-offs across alternative scenarios, some of which imply a payment via a tariff increase. This format might be less conducive to outright statements of zero WTP than when this option is offered in a menu of payment options for a single alternative, which is what is typically done in contingent valuation settings.

The 215 respondents who chose as their favourite option (1st best) the status quo option with zero cost in all four choice tasks are consistent with holding a zero WTP for at least all the scenarios included in the four choice sets. This behaviour is often referred to as "serial-non participation" or "non-trading". To evaluate whether these respondents had plausible economic reasons (as opposed to reasons to protest against the survey instrument) the socio-economic data were used for further investigation.

A cross tabulation of the variable 'serial non-participants' vs 'participants' on some socio-economic and attitudinal variables indicates that serial non-participants do not differ significantly from participants with regard to SEG or income band. Serial non-participants are significantly more likely to strongly agree that 'I would find it hard to pay more on my electricity bill'. They are also significantly more likely to disagree with the attitudinal statement 'It is fair that customers should be asked to pay for these improvements' and to agree that 'I do not think it is a good use of money at this time'. They are also less likely to agree that 'I do not think the countryside would be improved by lessening the visual impact of the transmission infrastructure' and more likely to disagree that 'I think there is a need to lessen the visual impact of existing transmission structure on the countryside'. In other words, serial non-participants differ significantly from participants in all of:

- attitudes indicating that they do not see the need for mitigation
- attitudes indicating that they feel generalised payment is unfair, and
- claimed constraints on affordability.

**Table 6: Variation in attitudes and ability to pay by serial non-participation**

| Attitude statement | Group | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree |
|---|---|---|---|---|---|---|
| | | % | % | % | % | % |
| I do not think the countryside would be improved by lessening the visual impact of the transmission infrastructure | serial non-participants | 7 | 33 | 11 | 33 | 16 |
| | participants | 37 | 34 | 13 | 10 | 7 |
| I do not think it is a good use of money at this time to lessen the visual impact of the transmission infrastructure on the countryside | serial non-participants | 3 | 12 | 7 | 36 | 41 |
| | participants | 17 | 30 | 18 | 22 | 13 |
| I would find it difficult to pay any more on my electricity bill | serial non-participants | 4 | 9 | 14 | 22 | 51 |
| | participants | 11 | 31 | 18 | 22 | 18 |
| I think there is a need to lessen the visual impact of existing transmission structure on the countryside | serial non-participants | 20 | 34 | 15 | 22 | 8 |
| | participants | 3 | 14 | 17 | 39 | 28 |
| I think it is fair that customers should be asked to pay for these | serial non-participants | 40 | 23 | 9 | 22 | 6 |

| | | | | | | |
|---|---|---|---|---|---|---|
| improvements | participants | 14 | 21 | 22 | 33 | 11 |

To further investigate this issue a series of binary logit models was estimated by maximum likelihood. The explanatory variable was whether a respondent engaged trading, and displayed a positive willingness to pay for mitigation. Details of these models are included in Appendix G.

In summary, the pattern of significance suggests that those who show positive willingness to pay have plausible attitudinal economic reasons to do so. The overall picture suggests that those who are willing to pay also tend to strongly agree with the statement that "... there is a need to lessen the visual impact of existing transmission structure on the countryside", and that they are more likely to state a willingness to pay if they visit AONBs/NSAs at least once.

On the other hand they are not likely to be among those who stated a willingness to pay when strongly agreeing with the statement "I **do not** think it is a good use of money at this time to lessen the visual impact of the transmission infrastructure on the countryside", or when they strongly agree that they "would find it difficult to pay any more on my electricity bill". Seeing pylons or transmission lines in their daily life is also correlated positively with being willing to pay, but was excluded from the model because it has borderline insignificance at conventional levels.

## 4.7 Landscapes Prioritised for Mitigation

**Key Findings**

- More than a quarter (28%) would prioritise the open countryside for lessening the visual impact of electricity transmission infrastructure, with a further fifth (19%) stating this as their second choice. In all, nearly two thirds (62%) give this as their first, second or third choice for lessening the visual impact of transmission infrastructure
- Half give rolling countryside as their first, second or third choice for lessening the visual impact of transmission infrastructure
- Nearly a quarter (23%) think it is more important to lessen the visual impact of the infrastructure in areas near houses
- Just 15% give areas near water as their first, second or third choice for lessening the visual impact of transmission infrastructure

More than a quarter (28%) prefers the open countryside to be prioritised for lessening the visual impact of electricity transmission infrastructure, with a further 19% stating this as their second choice. In all, nearly two thirds (62%) give this as their first, second or third choice for lessening the visual impact of transmission infrastructure.

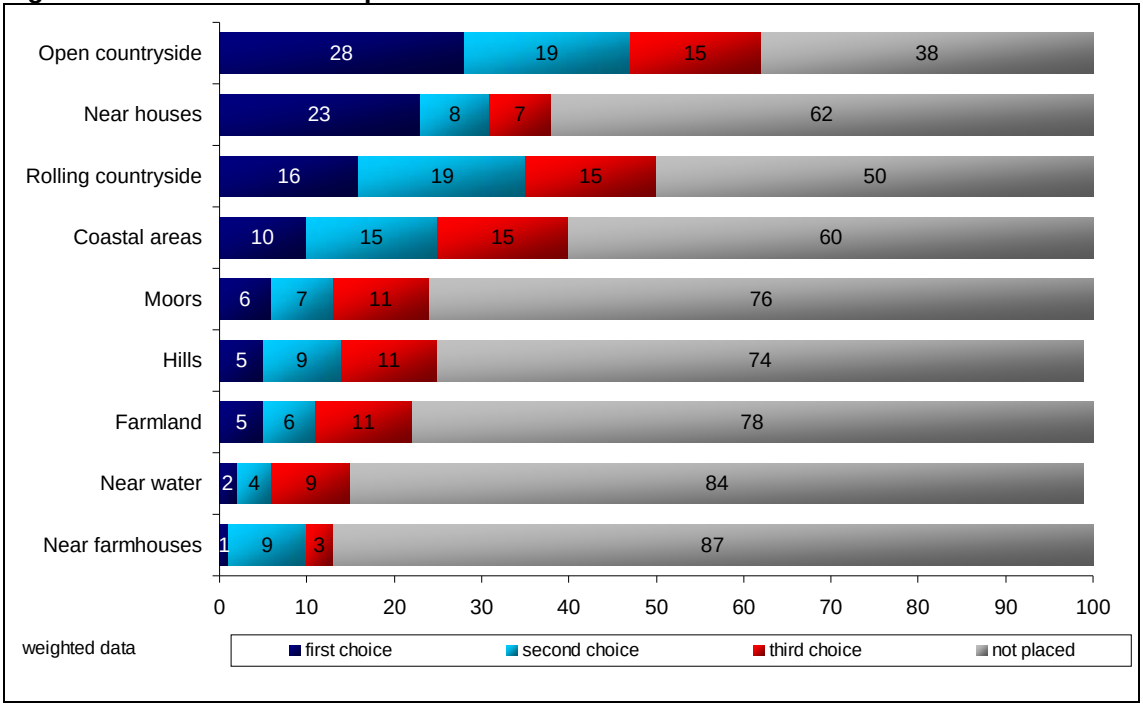
Half give rolling countryside as their first, second or third choice for lessening the visual impact of transmission infrastructure.

Nearly a quarter (23%) thinks it is more important to lessen the visual impact of the infrastructure in areas near houses.

Just 15% give areas near water as their first, second or third choice for lessening the visual impact of transmission infrastructure.

Figure 22 shows the preferences for different landscape types.

**Figure 22: Preferred landscapes for measures**

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## 4.8 Mitigation in Context

**Key Findings**

- Overall, consumers think there is a need to lessen the visual impact of transmission infrastructure (59%) and that the countryside would be improved by doing so (64%)
- Although 44% believe this is not a good use of money at this time, 40% think that it is
- There is a similar split as to whether it is fair to ask customers to pay for these improvements: 40% think it is fair, but 41% disagree. ABC1 respondents are more likely to agree that it is fair
- Nearly half (47%) would find it difficult to pay more on their electricity bill, particularly C2DE respondents
- Five per cent of respondents would prioritise mitigation of existing infrastructure without considering whether it is at the end of its life and needs replacing. A further 25% would prioritise mitigation of existing infrastructure when it needs replacing. There is most support (44%) for prioritising existing transmission infrastructure in protected areas, when it comes to the end of its natural life, together with future infrastructure
- When making their choices in the stated preference exercise, respondents mostly considered the benefits for the future (74%) and the benefit to the country as a whole (65%); any benefits to the local community or any personal impact were taken into account by less than half (47% and 46% respectively)
- Nearly half (48%) think it important to invest in lessening the visual impact of electricity transmission infrastructure. This contrasts with 90% who think that investing in making homes more energy efficient is important, 83% saying that investment in renewable sources

is important and 80% that cleaning rivers and other waterways is important

## Introduction

A number of questions were asked to put the valuations into context and understand respondents' motivations when making their choices. These included:

- attitudinal statements to spending on lessening the visual impact of infrastructure
- questions about what respondents had considered when making choices in the stated preference exercise
- the relative priority respondents would place on investment in mitigation of current infrastructure and future infrastructure
- the relative priority respondents placed on investment in electricity infrastructure compared to investment in other potential infrastructure projects.

## Attitudes to Spending on Lessening the Visual Impact of Infrastructure

Respondents were presented with five attitudinal statements regarding the need for and payment of measures to lessen the visual impact of transmission infrastructure on the countryside. They were asked to say how strongly they agree with these statements, using a scale of 1 to 5, where 1 equals strongly disagree and 5 equals strongly agree.

The five statements were:

- I do not think the countryside would be improved by lessening the visual impact of the transmission infrastructure
- I do not think it is a good use of money at this time to lessen the visual impact of the transmission infrastructure on the countryside
- I would find it difficult to pay any more on my electricity bill
- I think there is a need to lessen the visual impact of existing transmission structure on the countryside
- I think it is fair that customers should be asked to pay for these improvements.

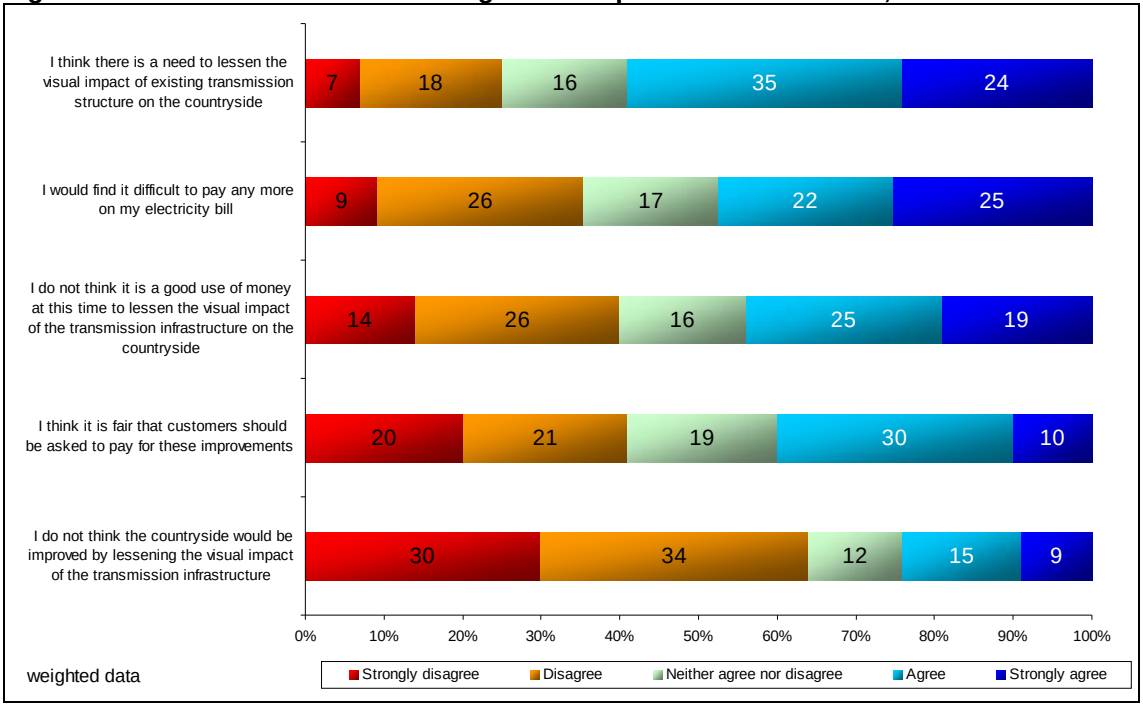
Overall, as Figure 23 shows, consumers think there is a need to lessen the visual impact of transmission infrastructure (59%) and that the countryside would be improved by doing so (64%).

However there is a polarisation on whether this is a good way to spend money at this time: 44% believe this is not a good use of money while 40% take the opposite view.

There is a similar split between whether it is fair to ask customers to pay for these improvements: 40% think it is fair, but 41% disagree.

Nearly half (47%) of respondents would find it difficult to pay more on their electricity bill.

**Figure 23: Attitudes towards lessening visual impact of infrastructure, overall**

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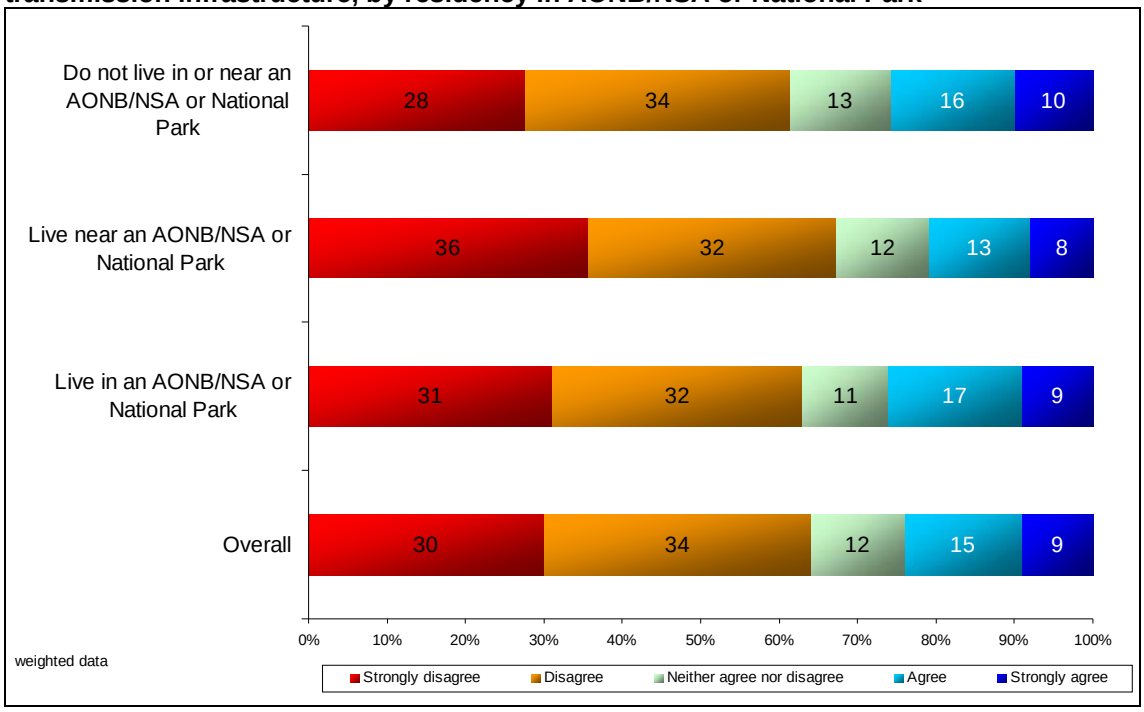
There are some small differences by segment on these attitude statements, detailed below.

## The countryside would not be improved by lessening the visual impact of the transmission infrastructure

Most respondents disagree with the statement that the countryside would not be improved by lessening the visual impact of the transmission infrastructure.

Those who live near an AONB/NSA or National Park disagree more than those who live in an AONB/NSA or National Park – 68% compared with 63% respectively (see Figure 24).

**Figure 24: The countryside would not be improved by lessening the visual impact of the transmission infrastructure, by residency in AONB/NSA or National Park**

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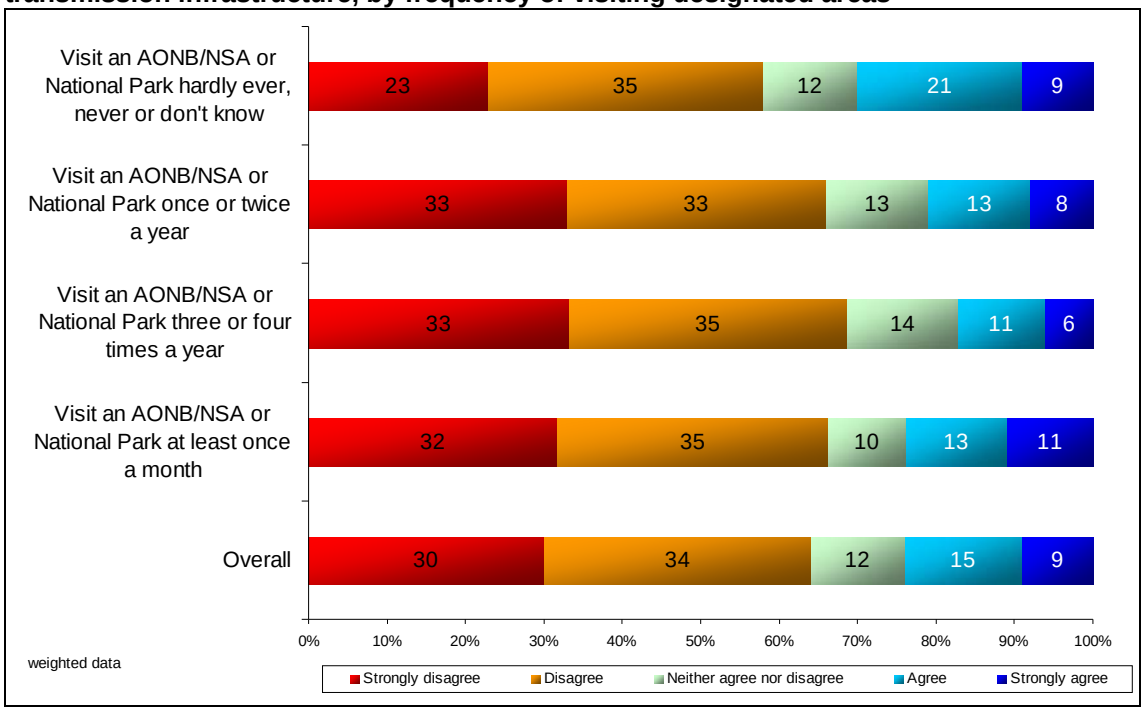
Those who visit AONBs/NSAs are more likely to disagree that the countryside would not be improved by lessening the visual impact of transmission infrastructure: 68% of those who visit three or four times a year, 67% of those who visit at least once a month and 66% of those who visit once or twice year disagree with this statement (see Figure 25).

**Figure 25: The countryside would not be improved by lessening the visual impact of the transmission infrastructure, by frequency of visiting designated areas**

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## There is a need to lessen the visual impact of existing infrastructure on the countryside

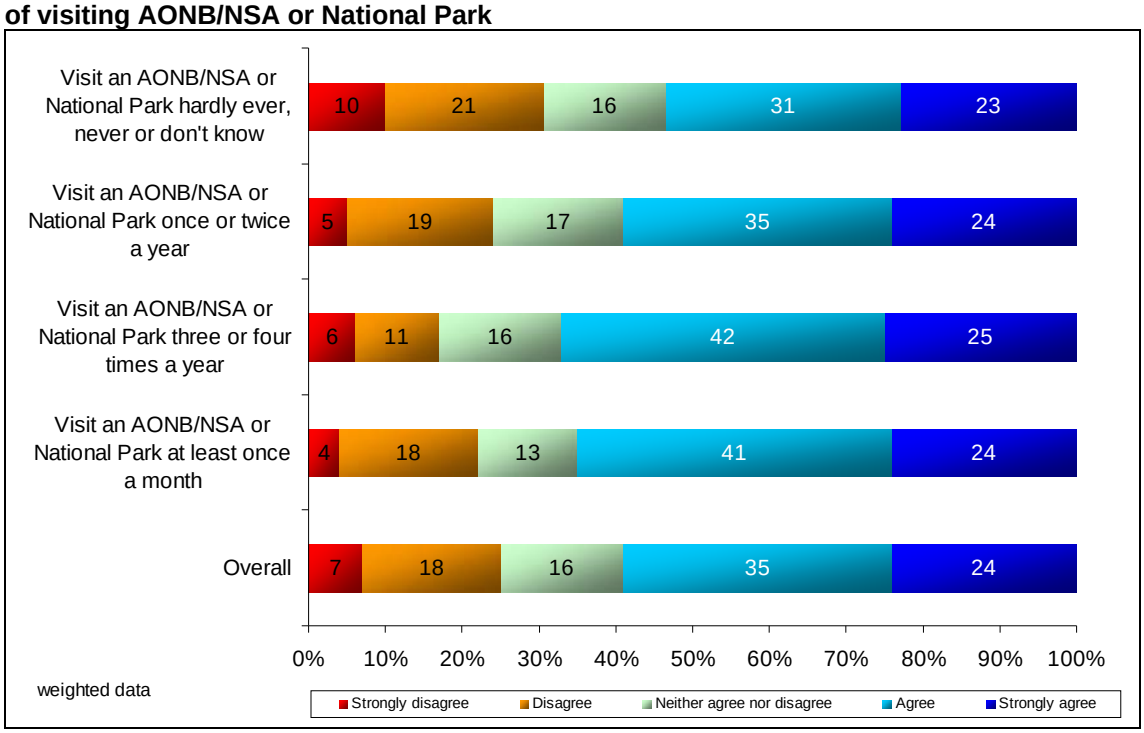
Over half agree with the statement that there is a need to lessen the visual impact of existing transmission structure on the countryside.

Those who visit or live near an AONB/NSA or National Park are more likely to agree with this statement.

Respondents who visit an AONB/NSA or National Park three or four times a year were more likely to say that there is a need to lessen the visual impact of the transmission infrastructure; 67% agreed with this statement (see Figure 26).

Similarly, among those who visit an AONB/NSA or National Park at least once a month, 65% agreed with this statement.

**Figure 26: There is a need to lessen visual impact of existing infrastructure, by frequency of visiting AONB/NSA or National Park**

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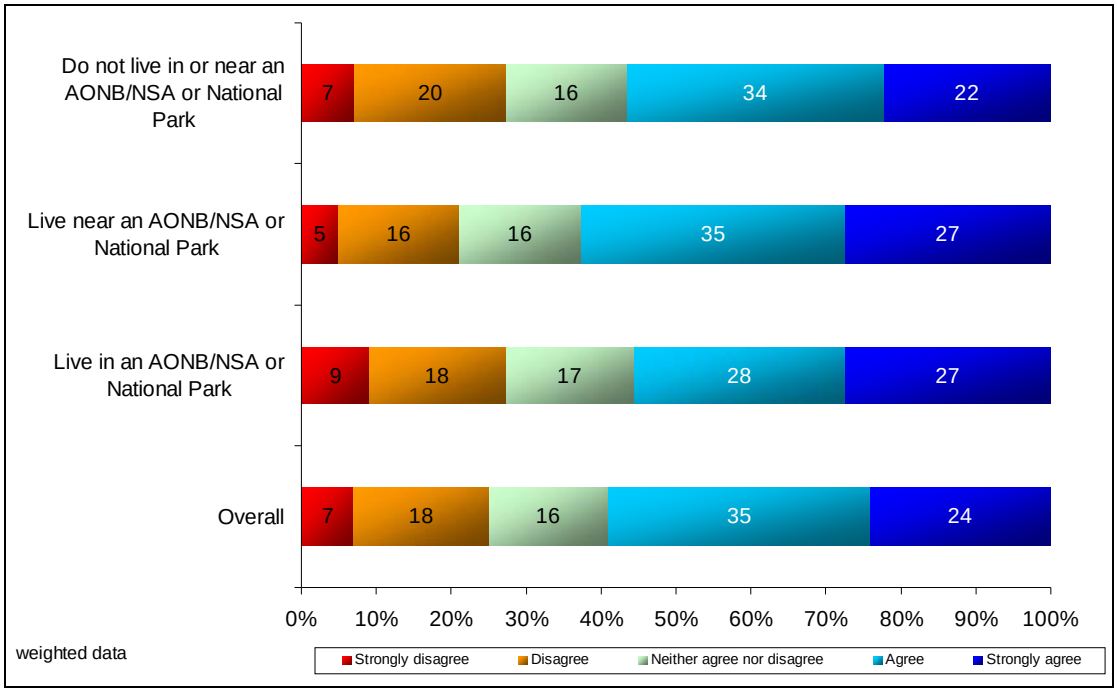
Those who live near an AONB/NSA or a National Park agree more that there is a need to lessen the visual impact of the transmission infrastructure – 62% agree compared with 55% of those who live in an AONB/NSA or National Park (see Figure 27).

**Figure 27: There is a need to lessen visual impact of existing infrastructure, by residency in AONB/NSA or National Park**

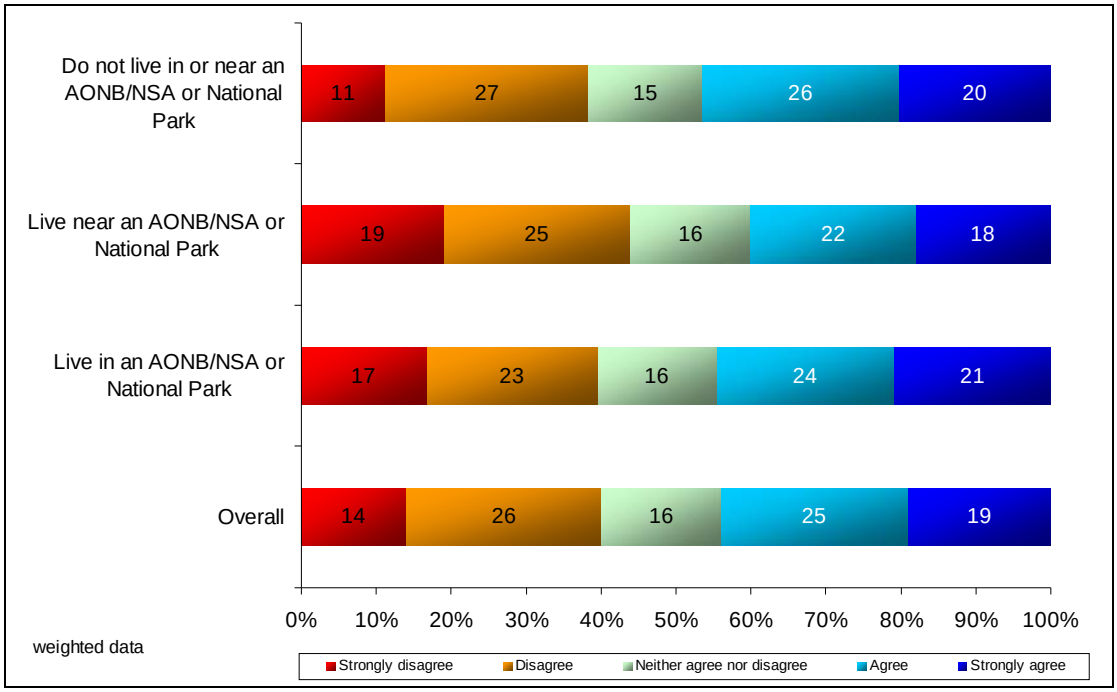



Base: 1002

## It is not a good use of money at this time to lessen the visual impact of the transmission infrastructure on the countryside

Those who live near an AONB/NSA or National Park disagree more that lessening the visual impact of transmission infrastructure is a not good use of money at this time: 44% disagree with this statement, compared with 40% of those who live in an AONB/NSA or National Park and 38% of those who do not (see Figure 28).

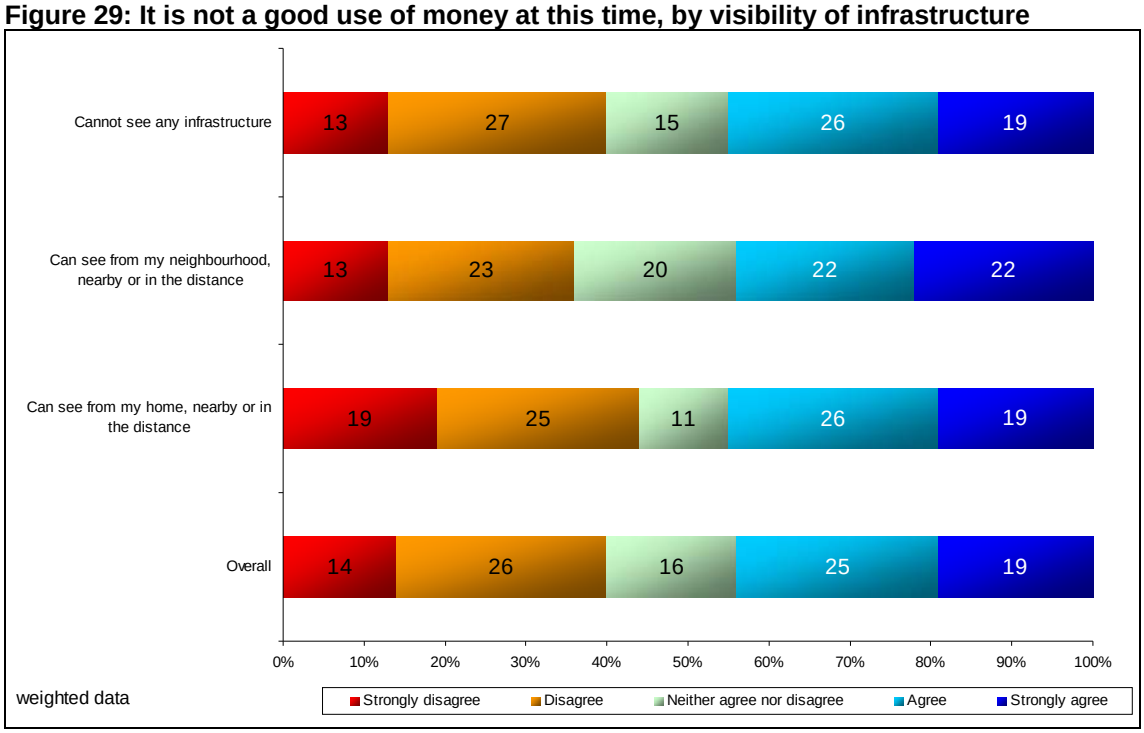
**Figure 28: It is not a good use of money at this time, by residency in AONB/NSA or National Park**




Base: 1002

Respondents who can see transmission infrastructure from their home were evenly divided as to whether it is a good use of money at this time to lessen the visual impact of the transmission infrastructure on the countryside: 45% agree that it is not a good use of money at this time while 44% disagree (see Figure 29).

**Figure 29: It is not a good use of money at this time, by visibility of infrastructure**




Base: 1002

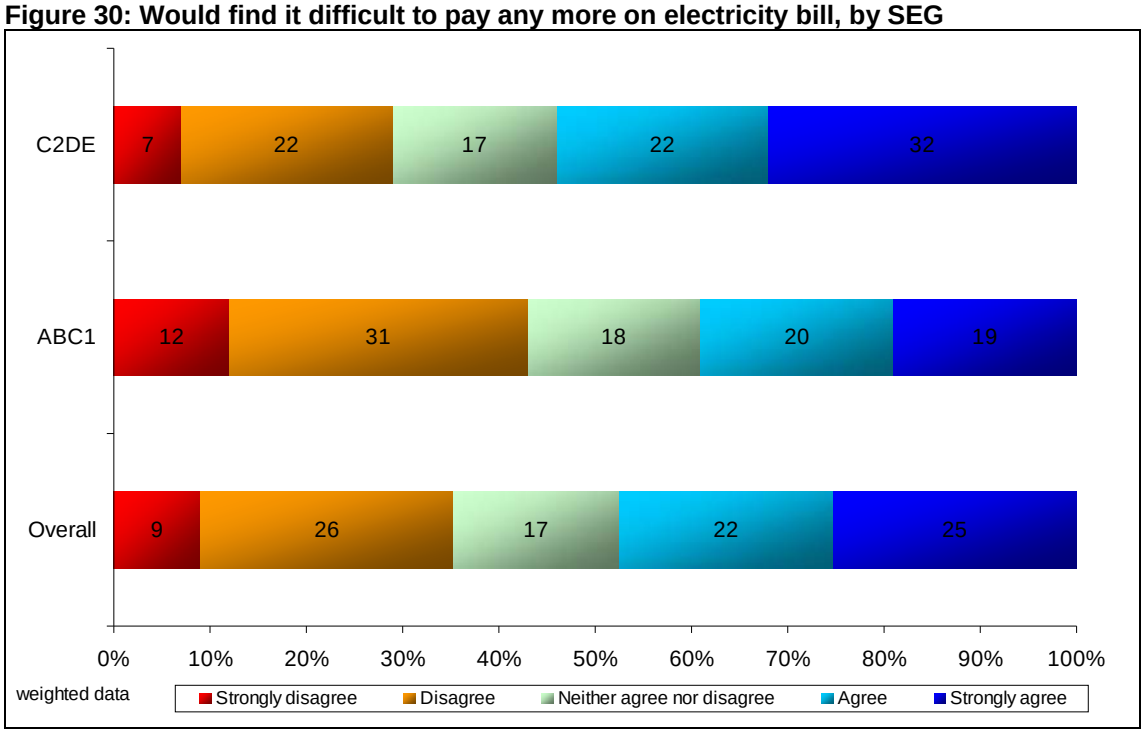
## I would find it difficult to pay any more on my electricity bill

Overall, nearly half (47%) of respondents would find it difficult to pay more on their electricity bill.

More than half of C2DE respondents agree that they would find it difficult to pay any more on their electricity bill (see Figure 30): 54% agree with this statement, with a third (32%) strongly agreeing.

ABC1 respondents are more likely to say they would not find it difficult to pay any more on their electricity bill: 43% disagree with this statement.

**Figure 30: Would find it difficult to pay any more on electricity bill, by SEG**

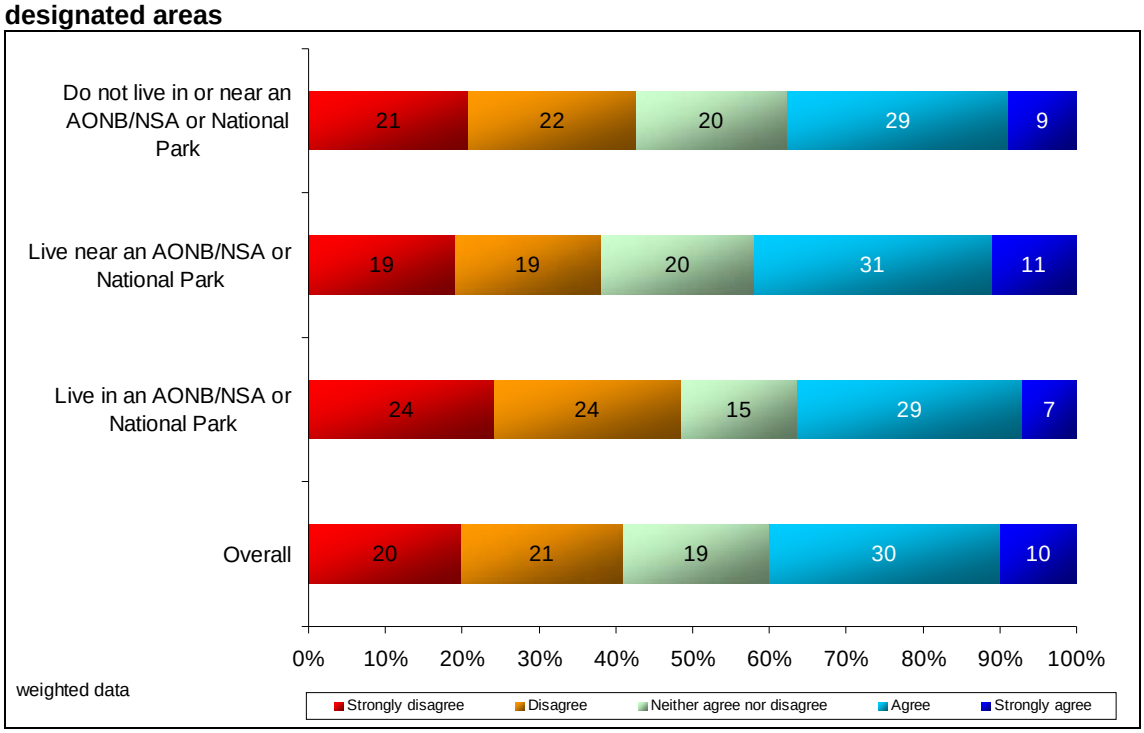



Base: 1002

## It is fair that customers should be asked to pay for these improvements

Overall, 40% agree that it is fair that customers should be asked to pay for improvements to lessen the visual impact of electricity transmission infrastructure on the countryside. Those who live near an AONB/NSA or National Park agree more (42%) than those who live in a designated area (36%), as Figure 31 shows.

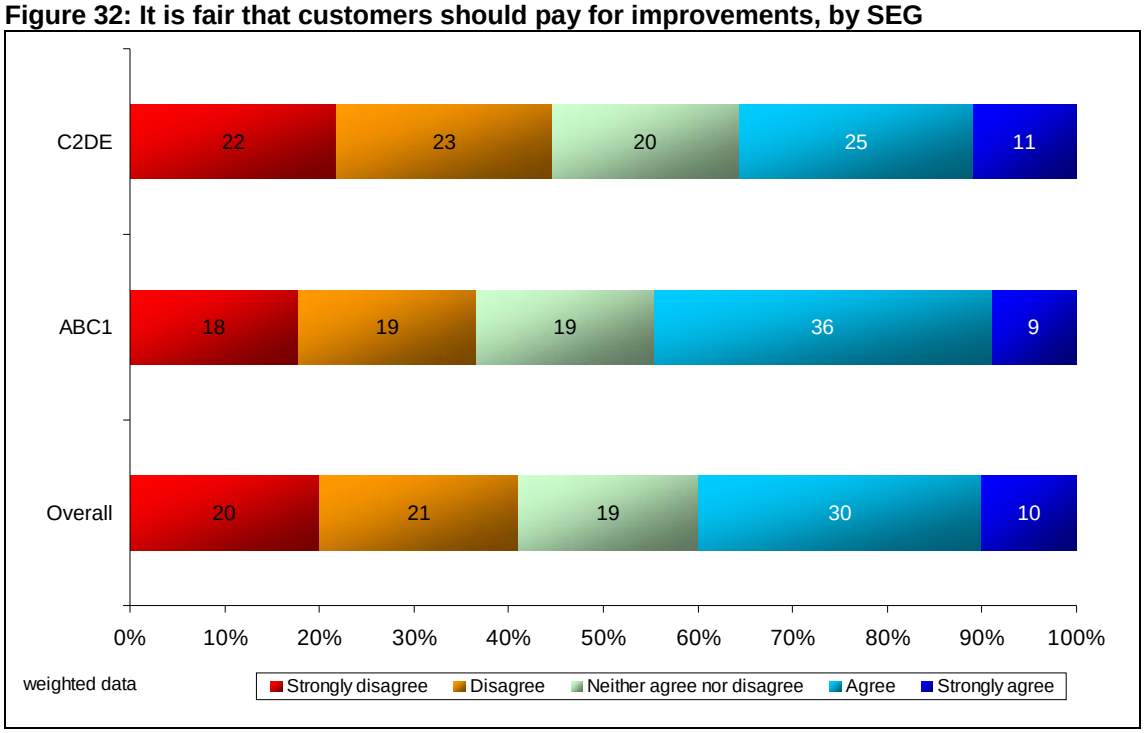
**Figure 31: It is fair that customers should pay for improvements, by residency in designated areas**




Base: 1002

ABC1 respondents agree with this statement more (45%) than C2DE respondents (36%), as Figure 32 shows.

**Figure 32: It is fair that customers should pay for improvements, by SEG**




Base: 1002

## Considerations when Making Choices

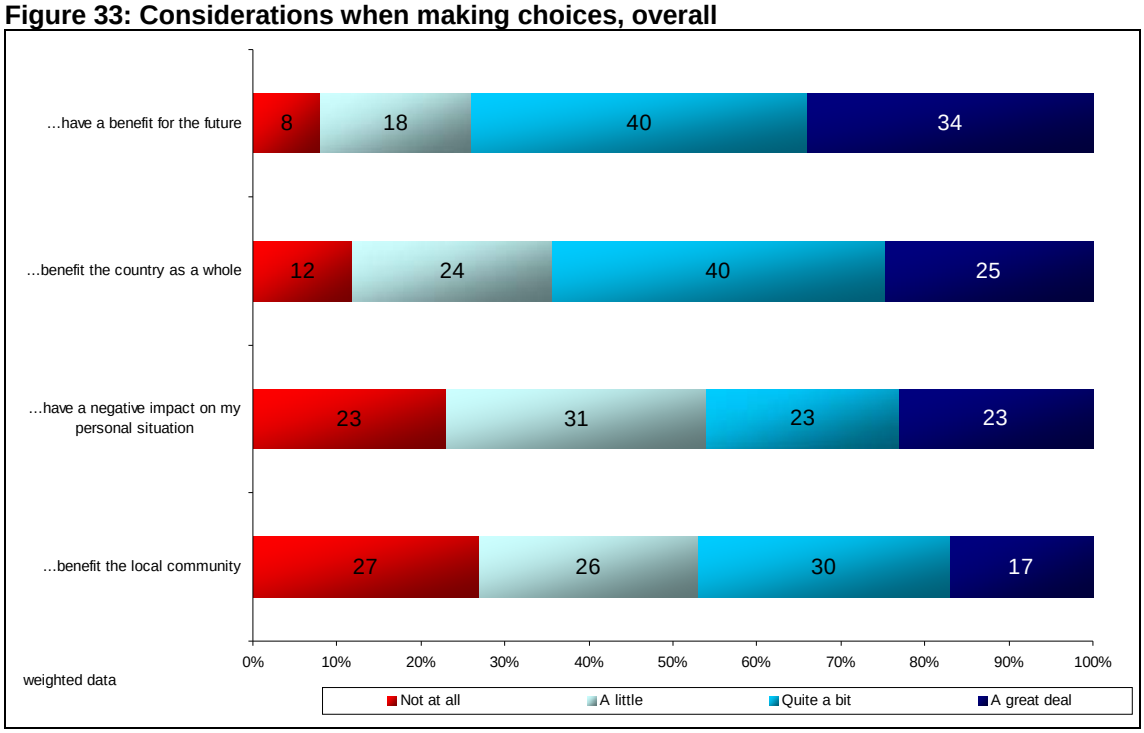
Respondents were presented with a number of possible considerations that may have guided their choices in the stated preference exercise:

- the potential benefit to the country as a whole
- the potential benefit their local community
- a potential negative impact on their personal situation, and
- a potential benefit for the future.

Respondents mostly considered the benefits for the future when making their choices; three quarters (74%) say they took this into consideration (see Figure 33). Two thirds (65%) say they considered the benefit to the country as a whole.

Less than half considered any benefits to the local community (47%) or any personal impact (46%).

**Figure 33: Considerations when making choices, overall**




Base: 1002

## Relative Priority for Spending on Current and Future Infrastructure Projects

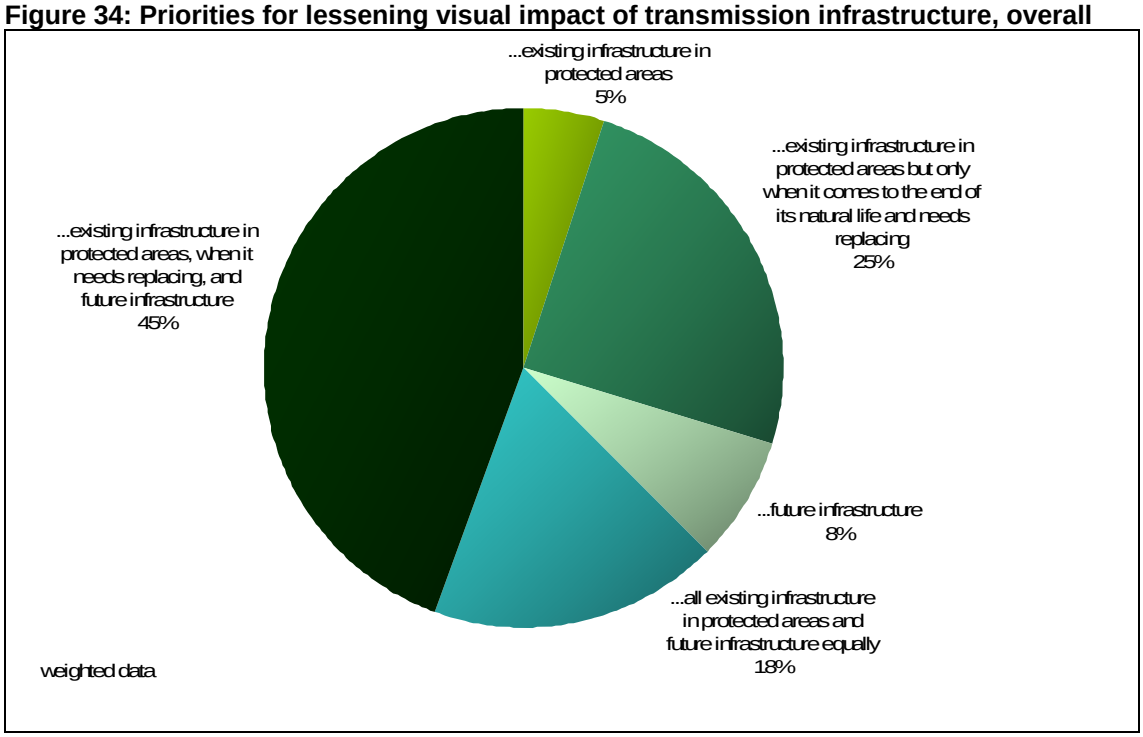
When considering their preferences for spending on current and future mitigation projects only 5% of respondents would select mitigation of existing infrastructure in protected areas without consideration of replacement needs.

A further 25% would prioritise existing infrastructure in protected areas, but only when it comes to the end of its life and needs replacing.

Just 8% would prioritise future infrastructure only.

Most respondents would like to see mitigation of both current and future infrastructure, and the most widely held preference is for prioritising existing transmission infrastructure in protected areas, when it comes to the end of its natural life, together with future infrastructure; 45% of respondents overall gave this approach as their priority (see Figure 34).

**Figure 34: Priorities for lessening visual impact of transmission infrastructure, overall**




Base: 1002

## Importance of Investment Programmes

Respondents were asked to consider a number of areas for investment, in addition to lessening the visual impact of transmission infrastructure, and say how important they considered each to be. The potential investment areas were:

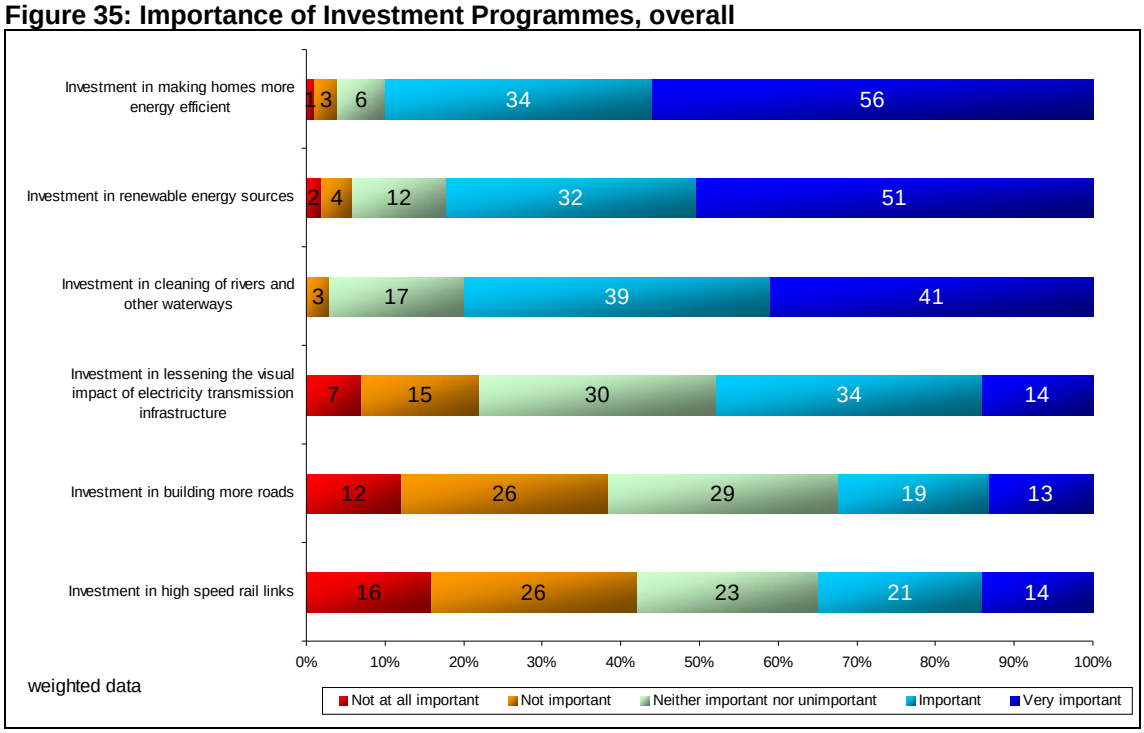
- high speed rail links
- building more roads
- lessening the visual impact of electricity transmission infrastructure
- cleaning of rivers and other waterways
- renewable energy sources
- making homes more energy efficient.

Overall, respondents think that making homes more energy efficient is the most important, with 90% agreeing that it is important. Eighty-three per cent consider investment in renewable sources to be important and 80% say that cleaning rivers and other waterways is important.

Investment in transport is considered to be less important, with 32% saying building more roads is important and 35% saying that investment in high speed rail links is important.

As Figure 35 shows, nearly half (48%) say that investment in lessening the visual impact of electricity transmission infrastructure is important. Investment in this area is of a similar order of importance (although somewhat higher) as transport infrastructure projects and is considered substantially less important than investment in making homes more energy efficient, renewable energy sources or cleaning rivers and other waterways.

**Figure 35: Importance of Investment Programmes, overall**




Base: 1002

# 5. LITERATURE REVIEW

Appendix H provides a review of the international literature on studies conducted to value the benefits from mitigation of the impact of high voltage transmission lines focussing on those conducted by means of stated preference methods. The review reveals a very heterogeneous landscape in terms of value estimates, methods and unit of reference. Apart from many hedonic studies based on variation of property values, a number of stated preference methods have been employed using both contingent valuation and choice based methods of the type employed in our study.

Most studies elicited willingness to pay to obtain the benefits and a few also elicited willingness to accept to forego them. In terms of estimating the benefit from reduction of visual intrusion in the countryside or in protected areas, the literature is very limited. A few studies though segregated the sample on the basis of the distance and perceived damage and on the basis of the location of residence in urban and rural samples. The present study is one of those with the largest sample sizes across the reviewed studies. Very few studies tried to explore the sensitivity to scope of mitigation.

The following table summarises the main features of the reviewed stated preference studies reporting, in as much as is possible, the estimated values in 2012 pounds, since these referred to different periods and different currencies.

| Study | Location | Method | Sample size | What valued | Estimate in original currency | in today GBP terms |
|---|---|---|---|---|---|---|
| Garrod and Willis (1998). | British inland waters | Choice ranking | 932 | pipe bridges, pylons and cable crossings | 1% reduction in pylons was valued £290,000 | £435,000 |
| Rosato et al. (2004) | Italy | Double bounded CV | 252 | undergrounding of all overhead lines in Italy | €527,13 | £417 |
| Giaccaria, Frontuto and Dalmazzone (2010). | Piedmont, Italy | Double bounded CV | 1019 | 5km stretch of HVTL from the respondent's municipality | low perceived damage €178-€200 | £128-144 |
| Giaccaria, Frontuto and Dalmazzone (2010). | Piedmont, Italy | Double bounded CV | 98 | 5km stretch of HVTL from the respondent's municipality | intermediate perceived damage €512-€626 | £368-450 |
| Giaccaria, Frontuto and Dalmazzone (2010). | Piedmont, Italy | Double bounded CV | 77 | 5km stretch of HVTL from the respondent's municipality | large perceived damage €2,758-€4,748 | £1983-3414 |
| Navrud et al. (2007). | Oslo | Payment card CV | 601 | Undergrounding parts of overheads in Oslo | separate estimates by distance to power lines and links | |
| Atkinson, Day and Mourato (2006) | UK | CV, various value elicitation methods | 785 | WTA and WTP for undergrounding and various designs for transmission towers | mean for undergrounding £65.53 | £84.5 |
| Marazzi and Tempesta (2005) | Veneto, Italy | Double bounded CV | 553 | WTA to give up undergrounding and WTP to obtain it | WTP = €155 and WTA = €456 | WTA=£304-WTP=£122 |
| McNair et al. (2011), | Canberra, Australia | Choice Experiments | 1163+292 | Undergrounding of lower voltage distribution networks | AUD6,838 | £4,000 |

# 6. SUMMARY AND CONCLUSIONS

## 6.1 Affordability

- Affordability was seen to have been constrained by increases to household bill sizes accompanied by reduced or static incomes over the past two years.
- The costs of petrol/diesel have increased dramatically over the past two years, while food, gas and electricity bills have also risen.
- Total household incomes have mostly fallen or remained static over the past two years or, if they have risen, have not matched increases to household bills.
- Those who had experienced a change in their total household incomes over the last two years mostly thought these changes would last at least another two to five years (35%), if not longer (38%).

## 6.2 Electricity Bill Size

- The average size of the electricity bill is £671 pa, with more than half (56%) paying £500 pa or more.
- Most respondents pay their electricity bill monthly (70%) and by direct debit (74%).

## 6.3 Usage of the Countryside

- Overall, 2% of respondents say they live in a National Park, and 10% in an AONB or NSA.
- Over half (51%) say they live within an hour's drive of an AONB/NSA and a third (37%) within an hour's drive of a National Park.
- Half (52%) of those who do not live in an AONB/NSA visit an AONB/NSA at least three or four times a year with a further 28% visiting at least once or twice a year.
- 39% of those who do not live in a National Park visit a National Park at least three or four times a year with a further 32% visiting at least once or twice a year.
- Nearly three quarters (72%) of those who live in urban or town and fringe areas visit a non-designated rural area at least three or four times a year with a further 11% visiting at least once or twice a year.
- The most widely mentioned activities undertaken in designated landscapes and other rural areas were cycling, running and walking; some three quarters (76-77%) gave these activities for AONBs/NSAs and two thirds (67%) gave these activities for other rural areas.

## 6.4 Attitudes to Electricity Transmission Infrastructure

- Electricity transmission infrastructure is considered to be 'necessary and unavoidable' by 62% of respondents.
- However, it is also considered to be 'ugly and an eyesore' by 55% of respondents.
- Two fifths neither feel strongly about electricity transmission infrastructure (41%) nor notice it (42%).
- One third (32%) consider electricity transmission infrastructure to be industrial architecture/heritage.
- While there are some small differences in strength of attitudes by subgroup, overall the pattern of attitudes is very similar across age groups, location of residence, usage of the landscape and proximity to electricity infrastructure.
- Those who live in or near a designated area are a little more likely to disagree that the infrastructure is ugly and an eyesore.
- Respondents who cannot see any transmission infrastructure from their home are slightly more likely than other respondents to consider it ugly and an eyesore.
- The younger (18-44) respondents are more likely to agree that the infrastructure is necessary and unavoidable (71% of this group agreed compared to 62% overall).
- Respondents aged 65+ years are more likely than other age groups to agree that they do not feel strongly about transmission infrastructure in the countryside.
- The older age group (65+ years) are more likely than other age groups to agree that transmission infrastructure is industrial architecture/heritage; but 45-54 year olds are more likely to disagree with this statement.

## 6.5 Preference for Mitigation Method

- In a straightforward ranking question, undergrounding is the first choice for more than half (55%) of respondents as a method for lessening the visual impact of transmission infrastructure on the countryside. Nearly a quarter (22%) place undergrounding last in their order of priorities.
- A quarter (25%) give screening with trees as their first choice and 12% prefer the new T-pylon.
- Preference for mitigation method is consistent across location of residence and frequency of use of designated landscapes.
- Those who can see pylons from their home are slightly more likely than others to place screening with trees in first place.

## 6.6 Consumers' Willingness to Pay

- The estimated order of benefits from mitigation types place undergrounding at the top, followed by or on-par with screening, and followed by T-pylons, which is in turn followed by rerouting.

- Short length mitigation projects of 5 and 10 miles show significant sensitivity to neither location nor length. However, the relative ranking of mitigation types is consistent with that observed in larger projects, with undergrounding producing an estimated benefit of £13.40 per household per annum, screening of £8.65, T-pylons of £1.75 and re-routing of £0.70.

- For programmes of 20 miles, consumers are more sensitive to location. For a programme of 20 miles in AONBs/NSAs they are willing to pay more than for the same programme in National Parks or other rural areas. WTP for undergrounding 20 miles of infrastructure in AONBs/NSAs rises to £16.27. WTP for a programme of other mitigation measures in AONBs/NSAs also increases with the measures remaining in the same order and proportion as before.

- The scenario with the highest WTP is a 50 mile programme of undergrounding in AONBs/NSAs. Consumers are willing to pay an additional £20.33 per annum to achieve this level of mitigation. The value of a similar programme in National Parks is not significantly different, at £19.84. Values for all measures in other rural areas are also increased at 50 miles, but to a lesser extent.

- Approximately 20% of respondents had an implied zero WTP. These were not drawn from any particular income or socio-economic group. Those who refuse to pay are both less likely to see the need for mitigation, and to say they have economic constraints to paying more.

- Published literature on this topic contains few directly comparable studies in terms of values of WTP for mitigation in protected landscapes. Indications are that the values obtained in this study are lower or broadly in line with what has been found elsewhere. The 20% proportion of consumers who had a zero WTP is lower than the 40% found in the previous Brunswick study but in line with other published literature eg Garrod and Willis (1998). The use in this study of the indirect method of eliciting WTP, plus the offering of a wider range of means of mitigation, is likely to have resulted in a lower refusal to pay and therefore a more realistic estimate of the value placed on the mitigation.

- A scaling factor of 0.74 is suggested as appropriate to account for potential hypothetical bias. Using this scaling factor would be a good precautionary measure when conducting a sensitivity analysis on the benefit-cost ratios of projects.

## 6.7 Landscapes Prioritised for Mitigation

- More than a quarter (28%) would prioritise the open countryside for lessening the visual impact of electricity transmission infrastructure, with a further fifth (19%) stating this as their second choice. In all, nearly two thirds (62%) give this as their

first, second or third choice for lessening the visual impact of transmission infrastructure.

- Half give rolling countryside as their first, second or third choice for lessening the visual impact of transmission infrastructure.

- Nearly a quarter (23%) thinks it is more important to lessen the visual impact of the infrastructure in areas near houses.

- Just 15% give areas near water as their first, second or third choice for lessening the visual impact of transmission infrastructure.

## 6.8 Mitigation in Context

- Overall, consumers think there is a need to lessen the visual impact of transmission infrastructure (59%) and that the countryside would be improved by doing so (64%).

- Although 44% believe this is not a good use of money at this time, 40% think that it is.

- There is a similar split as to whether it is fair to ask customers to pay for these improvements: 40% think it is fair, but 41% disagree. ABC1 respondents are more likely to agree that it is fair.

- Nearly half (47%) would find it difficult to pay more on their electricity bill, particularly C2DE respondents.

- Five per cent of respondents would prioritise mitigation of existing infrastructure without considering whether it is at the end of its life and needs replacing. A further 25% would prioritise mitigation of existing infrastructure when it needs replacing. There is most support (45%) for prioritising existing transmission infrastructure in protected areas, when it comes to the end of its natural life, together with future infrastructure.

- When making their choices in the stated preference exercise, respondents mostly considered the benefits for the future (74%) and the benefit to the country as a whole (65%); any benefits to the local community or any personal impact were taken into account by less than half (47% and 46% respectively).

- Nearly half (48%) think it important to invest in lessening the visual impact of electricity transmission infrastructure. This contrasts with 90% who think that investing in making homes more energy efficient is important, 83% saying that investment in renewable sources is important and 80% saying that cleaning rivers and other waterways is important.

APPENDICES UNDER SEPARATE COVER