

STIRLING BEFORE PYLONS

acting with

FRIENDS OF THE OCHILS

as a Relevant Person Group

for the purposes of the

STIRLING SESSION

**of the Public Inquiry into
Scottish & Southern Energy's proposals for the
Beauly to Denny 400 KV Steel Tower Double Circuit
Overhead Electricity Transmission Line**

PRECOGNITION

Prof. Nick Hanley

**Willingness to Pay to avoid non-market economic impacts in the
Stirling area**

Introduction

- 1 My name is Nick Hanley, and I am Professor of Environmental Economics at the University of Stirling. Prior to my appointment at Stirling in 2003, I was Professor of Environmental Economics at the University of Glasgow, and prior to that I was Professor at the University of Edinburgh in the Institute of Ecology and Resource Management. I am the author of three textbooks on environmental economics, a member of DEFRA's Academic Panel, and the author of many refereed journal articles in the subject area. I am also one of the lead authors on the DEFRA/DoT guidelines on the use of the stated preference methodology employed in this study.

Purpose of this statement

- 2 This statement concerns a project we recently completed on the non-market economic impacts of the proposed Beaully-Denny line, as it passes through the Ochils and Stirling. The study was funded by the Scottish Economics Society, and is part of the PhD research of one of my students, Tatiana Sagdieva. Work on the project was undertaken by myself, Tatiana and my post doc, Dr Sergio Colombo. A fuller account of our analysis can be found in a discussion paper posted on the Departmental website (Hanley et al, "*Measuring the economic impacts from overhead electricity transmission lines: the Beaully-Denny proposal*", 2007 (StBP/2/23)).

Economic values

- 3 The construction of a new transmission line has important implications for the visual amenity of landscapes in rural and urban areas. Many local residents are opposing this project, and this is reflected in the stance taken by local authorities along the route. From an economics viewpoint, a reasonable response to such a level of opposition would be to actually evaluate the strength of public preferences for the alternative (under-grounding). This would make it possible, in one subject area, to state whether the benefits of the project to Scotland exceed its costs.

- 4 A development such as this will have landscape and visual impacts no matter what route is selected. The purpose of our study was to evaluate how great the measurable costs are from the visual effects of the transmission line. These costs are “non-market” values, since landscape is a public good, which commands no market price. Since the early 1970s, economists have been developing empirical methods to estimate such non-market values, based on the economic value concept of Willingness to Pay. For landscape quality, just as for a car or a music download, the economic value of that good can be measured by an individual’s willingness to pay to acquire it. Social values are then attributed by the aggregation of individual “willingness to pay amounts” across the affected population.

- 5 In this context then, our task is to estimate people’s willingness to pay (WTP) to avoid the landscape impacts of the Beaulieu-Denny project. We do this by offering people a hypothetical choice: to pay a higher price for their electricity to enable the transmission line to be put underground *for its whole length within the study area*, or to pay no increase in prices and have the line constructed above-ground as currently proposed. The “study area” here is the stretch of the line passing through the Ochil hills and on past Stirling. For any individual, their maximum WTP for “undergrounding” measures the disutility, or economic loss, that they would suffer from the current plan of over-ground transmission. For society as a whole, we can add up these individual WTP values across affected individuals to arrive at the aggregate (total) economic loss terms of disutility from the current project design. This total loss could then be compared with the costs of putting the transmission underground.

- 6 In order to estimate WTP, we use a technique called contingent valuation, a survey-based method that elicits preferences in monetary terms for changes in non-market goods (Bateman et al, 2002). This method is now used extensively world-wide for evaluating environmental impacts, and for some years has been routinely used by the UK government in evaluating environmental policy. For example, it is used by

DEFRA and the Department for Transport in policy appraisal, and by the Environment Agency and the Forestry Commission. It is also used by the World Bank, and in legal cases over environmental damages in the USA.

- 7 We use a “single bounded dichotomous choice” version of contingent valuation, whereby people are asked to vote ‘yes’ or ‘no’ to a hypothetical increase in electricity prices in order to have the line put underground. By varying the amount people vote on across respondents, a statistical function can be estimated which relates the probability of a “yes” response to the amount put to respondents. From this equation, mean WTP can be calculated using standard methods. For more details on the method, see *Hanley et al (2006, StBP/2/27)*. For an example of related work, see *Atkinson et al (2004, StBP/2/25)*.

Sampling and acquisition of data

- 8 Sampling was based on a random sample of households located in near to the proposed line in Stirling, Dunblane, Bridge of Allan, Falkirk and surrounding rural areas. A pilot study was carried out in order to identify the bid range for the WTP question, and to test question wording; 20 face-to-face interviews were conducted. The main survey was then conducted using a mail shot, since this was considered cost-efficient. 700 questionnaires together with an introductory letter and a map were sent. Respondents were asked to express their attitudes and views about renewable energy developments in general and about the Beaully-Denny transmission line in particular. Also, we estimated their willingness to pay (WTP) to have the transmission line buried underground, using the method detailed below.
- 9 The 700 questionnaires were divided into 8 groups, whereby respondents in each group were offered one “bid” (£): 7, 15, 30, 50, 95, 150, 225, 315. This bid was presented as a hypothetical annual addition to the standing charge on household electricity bills in order to allow the transmission line to be put underground through

the study area. Responses to this payment question are the key to estimating WTP to avoid the overhead line option.

- 10 Some 16 questionnaires were sent back because residents did not live there any more; whilst 305 usable answers were returned. There were thus 379 non-responses to the questionnaire. The overall response rate was 44%, which compares very favourably with other UK contingent valuation surveys. Only those questionnaires where the WTP answer was completed (280) were used for the analysis that follows (some people did not answer this question).

Results

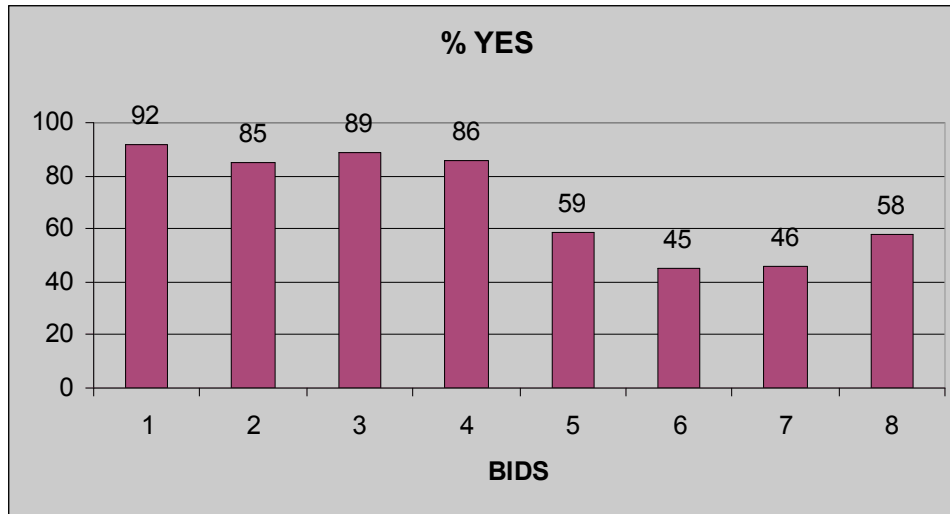
- 11 The expansion of hydro schemes was chosen as the best way of increasing “non-fossil fuel” energy by the sample, followed by wind power and nuclear power. Overall, respondents hold mainly positive attitudes towards existing wind farms: 59% consider them “very positive” or “mainly positive” whilst only 24 % have a “negative” attitude towards them. This is also true when respondents are asked about increasing the amount of on-shore wind farm energy, although the proportion who consider this “positive” is slightly lower (52%).
- 12 However, only 17% of respondents were in favour of the new transmission line. This is mainly due to the impression on the part of respondents that transmission lines have a serious negative impact in the landscape. Almost 80% of respondents think the overhead transmission lines would have a “negative” or “very negative” impact on the landscape, whilst only 8% consider the impact “positive”.
- 13 Table 1 shows the percentage of ‘yes’ responses to each of the bid levels used in the survey, we also show this graphically in Diagram 1.

Table 1. Percentage of ‘Yes’ and ‘No’ response to WTP question in relation to a bid

BID/£	Total	Yes	No	Yes/%	No%
7	25	23	2	92.00	8.00
15	48	41	7	85.42	14.58
30	48	43	5	89.58	10.42
50	37	29	3	86.48	13.52
95	39	23	16	58.97	41.03
150	20	9	11	45.00	55.00
225	39	18	21	46.15	53.85
315	24	14	10	58.33	41.67
	280	200	75		

14 As may be seen, at extra costs of below £50 per year, more than 80% of the sample say they are willing to pay this extra cost to have the line put underground. Even at the highest bid level (£315/year), 58% of respondents are willing to pay this cost. A clear majority of respondents thus vote against the current proposal at any of the cost levels used in the experimental design. Based on a simple regression of the probability of saying "Yes" on the bid value, we obtain a mean WTP of £179 household/annum, with a 95% confidence interval of £162-£195. This is an estimate of the mean economic welfare loss to respondents should the proposal go ahead.

Diagram 1. Percentage of 'Yes' answer for WTP question in relation to a bid



CONCLUSIONS

- 15 This study allows us to evaluate the economic costs of the visual impacts from the Beaully-Denny transmission line, as currently proposed. The respondents were given the opportunity to express their attitude towards the renewable energy development project, and their willingness to pay in order not to have the visual presence of the transmission line.
- 16 The main conclusion that arises is that a clear majority of these respondents are opposed to the scheme, and would be willing to pay quite substantial sums for the under-grounding of the line as it passes through the Stirling area. The mean willingness to pay was £179 per household per year: this is a measure of the economic cost of the over-ground transmission line in terms of loss of economic well-being to people in the study area. Multiplying this figure by the number of households in the area would show the annual loss in aggregate to local residents. Note that this does not include (i) losses in utility that might be experienced by holidaymakers/day visitors to the area; such losses would need to be added in to the losses we have quantified, and (ii) losses in utility to those Scots living outside the

study area who would nevertheless feel a loss from damage to the historic landscape around Stirling and the Ochils.

- 17 Some caveats remain. It was not possible with this data to show how WTP to avoid the landscape impact varies with the distance of the household from the proposed route; clearly, we might expect WTP to avoid the landscape effect to depend on how close one lives to the route. A new survey is just starting to investigate this effect empirically.
- 18 But the main conclusion is this: the Beaully-Denny line, as currently proposed, will impose significant economic costs on residents in the Stirling area, and is opposed by the majority of households. Given a total of 36,174 households living in Stirling Council area, this would involve an economic cost of at least £6.5 million per year if the overhead line proposal went ahead, assuming that our sample mean is representative of respondents throughout the council area.

REFERENCES

- Atkinson, G., B. Day, S. Mourato and C. Palmer (2004), ‘‘Amenity’ or ‘eyesore’? Negative willingness to pay for options to replace electricity transmission towers’, *Applied Economic Letters*, 11 (4), 203-8.
- Bateman I et al (2002) *Economic Valuation with Stated Preference Surveys*. Cheltenham: Edward Elgar.
- Hanley N, Shogren J and White B (2006) *Environmental Economics in Theory and Practice*, 2nd edition. Basingstoke: Palgrave.

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