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Local residents' attitudes to oil and nuclear developments

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ABSTRACT

Two studies are reported on the attitudes of local residents towards proposed oil and nuclear developments in the county of Dorset, England. Both studies used postal questionnaires. Study 1 included 402 residents of communities chosen so as to compare those living nearer the proposed oil and nuclear developments respectively. Those living closer to either proposed development (oil or nuclear) were more optimistic about its local economic benefits and more pessimistic about its environmental costs and associated risks than those living further away (even though the two developments are only about 10 miles apart). Study 2 included 421 residents of Wareham (a town half-way between the two developments). The format of the questionnaire was varied so as to compare how residents felt about either development, depending on whether or not they assumed that the other development would definitely proceed. There was some evidence that the oil development would be seen as less acceptable if the proposed nuclear development was assumed to be definite. In both studies the prospect of a new nuclear power station was seen as far less acceptable than that of new oil wells.

Opposition by local residents to the building of new nuclear power stations has been reported by many researchers (e.g. Rankin, Melber, Overcast and Nealey, 1981; van der Pligt, Eiser and Spears, 1986). Despite the fact that many individuals object in principle to the use of nuclear power, either for military or civil purposes, this does not seem a sufficient explanation for the degree of opposition at a local level. Rather the evidence suggests that local opponents and supporters of nuclear power programmes are differentiated more by their expectations of specific costs and benefits (e.g. Woo and Castore, 1980; Hughey, Sundstrom and Loundsbury, 1985; Eiser, van der Pligt and Spears, 1988). From this point of view the preponderance of local opposition is not especially surprising, granted that the local environmental costs and perceived risks of new nuclear power station are unlikely to be seen as fully balanced by compensatory benefits at a local level (Popper, 1983).

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Because of this perceived imbalance between costs and benefits, it might be inferred that much of the local opposition to nuclear power stations is not specifically antinuclear, but would be evident to a comparable extent in the event of any proposal for large-scale industrial expansion. This issue was addressed by van der Pligt *et al.* (1986) in a study of residents of a number of communities in south-west England that were on a short list for a possible new nuclear power station. Whereas these residents were generally opposed to a new nuclear power station in their neighbourhood, they also reported strong opposition to the hypothetical prospects of any other local industrial development of comparable scale, a local coal-fired power station, and (especially) a local chemicals factory.

In evaluating such data, however, it must be remembered that these alternative prospects were only hypothetical. Granted a policy (in Britain) of siting nuclear plants away from major centres of population, those parts of the country that are considered for nuclear development will be less likely to be considered for other forms of major industrial expansion. The comparison of attitudes towards nuclear and non-nuclear developments undertaken by van der Pligt *et al.* (1986) thus depends on a comparison of actual and hypothetical proposals.

The studies to be reported here, however, were conducted in a context that allowed direct comparisons of local residents' attitudes to actual prospects of nuclear and non-nuclear energy developments. The van der Pligt *et al.* (1986) and Eiser *et al.* (1988) studies report data collected in 1982 in communities in south-west England affected by the plans of the Central Electricity Generating Board (CEGB) for expansion of generating capacity in the region. After evaluating alternative sites the CEGB announced in August 1982 that it intended to apply for planning permission for a new nuclear power station at Hinkley Point in Somerset, whilst also retaining the option of a further nuclear power station at Winfrith in Dorset, adjoining the research establishment of the United Kingdom Atomic Energy Authority (UKAEA). These plans for nuclear expansion in the region have remained essentially unchanged since that time, and have been recently reaffirmed in March 1987, following government approval of the report of the Sizewell B Public Inquiry (Layfield, 1987).

The retention by the CEGB of the Winfrith option presents an interesting context for research. Within a predominantly rural area of great environmental interest and beauty, residents have both the experience of a (small-scale) nuclear plant already in operation and the prospect of a major expansion of the 'nuclear presence' in the medium term. An even more distinctive feature of this local context is the fact that the Winfrith plant is only about 10 miles to the west of the largest on-shore oil installation in the United Kingdom—the Wytch Farm development owned by British Petroleum (BP).

At the time of the studies to be reported there had been considerable exploratory activity by BP in the area around their existing development, leading to the prediction of a deeper reservoir extending under the sea at Poole Harbour. To assess the scale of this find, BP applied for, and on 12 April 1985 obtained, permission from Dorset County Council to drill appraisal wells on Furzey Island—a small island within Poole Harbour just to the north of the Wytch Farm site.

STUDY 1 ('PROXIMITY' STUDY)

The purpose of this study was to compare attitudes towards existing and new developments relating both to the nuclear and oil industries, primarily as a function of the proximity of these developments to people's place of residence. We also wished to identify those aspects of the proposed oil and nuclear developments that most concerned local residents, and were most predictive of their overall acceptance or opposition.

Method

Immediately following the announcement of the Dorset County Council decision in April 1985, a total of 800 questionnaires were sent to names drawn from the electoral registers of four areas within a few miles of the town of Wareham, which lies approximately half-way between Winfrith and Wytch Farm. Of these 800, 42 were no longer at their registered address and of the remaining 758, 402 (53.0 per cent) responded immediately or after one reminder. The four communities were as follows: (i) Winfrith and Lulworth, (ii) Wool, (iii) Corfe and Arne, (iv) part of Poole (mainly Sandbanks peninsula).

These four communities were treated as a 2×2 factorial design, in that Winfrith/Lulworth and Wool are closer to the nuclear development (to the west of the study area), whereas Corfe/Arne and Poole (Sandbanks) are closer to the oil development (in the east). At the same time, the two more northerly communities, Wool and Poole, are more built up, with the more southerly communities, Winfrith/Lulworth and Corfe/Arne being more rural in the sense of smaller villages and hamlets, and each including famous nearby 'beauty spots'—Lulworth Cove and Corfe Castle.

The questionnaire was designed to provide as direct comparisons as possible between respondents' attitudes towards oil and nuclear energy. Distinctions between attitudes towards local, regional and national developments were assessed, in the context of oil, by asking how respondents felt about the existing Wytch Farm development, new oil wells around Wytch Farm, on the south coast (other than Dorset) and in the North Sea; in the nuclear context they were asked about the existing Winfrith plant, a new plant at Hinkley Point in Somerset (an adjoining county) and elsewhere in the UK (not Dorset or Somerset). Ratings were on a scale from 1 = extremely opposed to 9 = extremely in favour.

Residents were then asked how they expected 12 different aspects of life in their neighbourhood would be affected by (a) drilling of oil wells, (b) operation of oil wells, (c) construction of a nuclear plant, and (d) operation of a nuclear plant. Responses were on a nine-point scale from 'very much for the worse' (scored as 1) to 'very much for the better' (9). The 12 aspects rated were the same in each of the four sections and were as follows: peace and quiet; freedom to come and go as you please; effects on agriculture; your personal health and safety; your personal financial situation; local business/employment opportunities; environmental pollution; the standard of local amenities and services; visual impact; the character of your town or village; local tourist trade; risk of a major environmental disaster. The order of sections was balanced with nuclear questions preceding oil questions for half the respondents (i.e. in the order c, d, a, b).

Results

The clearest single message from this study was that respondents were very considerably more well disposed to oil than to nuclear developments across a wide range of measures.

(a) *Attitudes to existing developments.* We compared, first of all, attitudes to the existing Wytch Farm and Winfrith developments by means of a multivariate analysis of variance. The grouping factors were 'Town' vs. 'Village' (i.e. north vs south), Near nuclear vs. Near oil (i.e. west vs. east) and Male vs. Female. There was one within-subjects factor: Oil/Nuclear. The mean acceptance rating for the existing oil wells was 6.81 on the nine-point scale compared with 5.01 for the existing nuclear plant; $F(1,375) = 157.64$, $p < 0.001$. The remaining effects were small by comparison. The most noteworthy was a significant interaction between the Town/Village and Oil/Nuclear factors, $F(1,375) = 6.18$, $p < 0.05$, with those in the more southern ('village') communities being somewhat more antinuclear and somewhat more pro-oil than those living in the more northern ('town') communities.

(b) *Attitudes to new developments.* We next performed a multivariate analysis of variance on ratings of the six possible new developments: oil/nuclear locally (Wytch Farm/Winfrith), regionally (south coast/north Somerset) or nationally (North Sea/elsewhere in the UK) with the same three grouping variables. The means (combining males and females) are shown in Table 1. Again, there was a massive main effect for the oil/nuclear comparison, $F(1,353) = 253.97$, $p < 0.001$. In addition, there was a main effect for sex, with females being somewhat more opposed to either development, $F(1,353) = 4.72$, $p < 0.05$. There was also a main effect due to the west vs. east comparison, with those in the more western communities being more favourable to either development, $F(1,353) = 4.14$, $p < 0.05$.

Table 1. Attitudes to new oil and nuclear developments (Proximity study)

	Town (north)		Village (south)		Overall
	Near Nuclear (west)	Oil (east)	Nuclear (west)	Oil (east)	
<i>Oil</i>					
New oil wells locally	5.9	5.2	6.3	6.1	6.1
Elsewhere in region (south coast)	6.3	5.2	5.8	5.4	5.7
Elsewhere in UK (North Sea)	7.9	8.2	8.2	7.8	8.0
<i>Nuclear</i>					
New nuclear station locally	4.2	4.1	3.0	3.6	3.7
Elsewhere in region (north Somerset)	4.9	4.6	4.7	4.1	4.6
Elsewhere in UK	5.5	5.2	5.2	4.8	5.2
<i>n</i>	91	89	94	87	361

Note: Scale is 1 = extremely opposed, 9 = extremely in favour

The main evidence for a relationship between preferences for new oil or nuclear power and how near residents lived to existing oil or nuclear installations comes from a single-degree-of-freedom component of the three-way interaction term based on the first, second, fourth and fifth rows of Table 1. Specifically, after collapsing over the Town/Village distinction, the West/East $\times$ Oil/Nuclear $\times$ Local/Regional effect yields an $F(1,353)$ of 19.65, $p < 0.001$. This effect seems best interpreted as follows: in the case of oil, those living nearer to Wytch Farm are rather keener to see new oil development, either locally (6.6) or elsewhere on the south coast (6.1) than are those living further away (means: local, 5.6, regional, 5.3). In the case of nuclear power, whereas those living further from Winfrith would rather have a new power station at Winfrith than in Somerset (i.e. at Hinkley Point) (means: local, 3.8, regional, 2.7), the reverse was true for those living nearer the Winfrith plant (means: local, 3.6, regional, 4.8).

(c) *Expectations of impact of new development.* A further multivariate analysis of variance was conducted with the same grouping variables, and the four sets of 12 'impact' items. Males tended to be less pessimistic than females overall, (i.e. considering all 48 ratings as a whole); means were: males, 4.34, females, 4.29, $F(1,300) = 6.84$, $p < 0.01$. Oil developments were evaluated less negatively than nuclear developments, $F(1,300) = 90.13$, $p > 0.001$, particularly in the 'village' as opposed to the 'town' communities, $F(1,300) = 8.46$, $p < 0.01$, and particularly among those living nearer to Winfrith than to Wytch Farm, $F(1,300) = 20.41$, $p < 0.001$, this last interaction being slightly stronger for females, $F(1,300) = 5.74$, $p < 0.05$.

Overall, respondents were more pessimistic about the operation than the drilling/construction phases of either development, $F(1,300) = 8.88$, $p < 0.01$ (see Table 2). This was more evident, though, in the nuclear context, $F(1,300) = 5.94$, $p < 0.0005$, especially in the 'village' communities, $F(1,300) = 7.34$, $p < 0.01$ and among males, $F(1,300) = 4.03$, $p < 0.05$. Some of these effects varied in strength depending on the individual impact items. The Oil/Nuclear $\times$ Impact interaction yielded a multivariate $F(11,290)$ of 19.79, $p < 0.001$. This reflected particular pessimism with respect to the impacts of nuclear as opposed to oil developments on personal health and safety,

Table 2. Overall mean ratings of impacts of oil and nuclear developments (Proximity study)

	Town (north)		Village (south)	
	Near Nuclear (west)	Oil (east)	Nuclear (west)	Oil (east)
<i>Oil</i>				
Drilling	4.86	4.48	4.81	4.71
Operation	4.85	4.43	4.78	4.74
<i>Nuclear</i>				
Construction	4.29	4.33	3.87	4.42
Operation	4.27	4.30	3.79	4.19
<i>n</i>	80	69	83	76

Note: Scale is 1 = very much for the worse; 9 = very much for the better.

and the risk of a major environmental disaster, as well as in terms of visual impact, the character of the town/village, and pollution.

The Construction/Operation $\times$ Impact interaction, $F(11,290) = 19.02, p < 0.001$, mainly reflected greater optimism of business/employment benefits but greater pessimism regarding peace and quiet during drilling/construction, and greater pessimism regarding personal health and safety, the risk of disaster and pollution during operation. These differences between phases were more marked on nuclear items, yielding a significant Oil/Nuclear $\times$ Construction/Operation $\times$ Impact interaction, $F(11,290) = 9.20, p < 0.001$. The West/East $\times$ Oil/Nuclear $\times$ Impact interaction, $F(11,290) = 11.26, p < 0.001$, reflected the fact that those living nearer Winfrith were more optimistic than those living nearer Wytch Farm about the impact of a nuclear development on business and employment, but more pessimistic about its impact on peace and quiet, character of their town/village, visual environment, pollution, health and safety and agriculture particularly, whereas this pattern was reversed when considering the impact of an oil development. The Town/Village $\times$ West/East $\times$ Oil/Nuclear $\times$ Impact interaction, $F(11,290) = 3.16, p < 0.001$, also achieved significance, apparently due to the residents of Poole (Sandbanks) being particularly worried about the visual impact of a new oil development, but less worried about the impact of a new nuclear power station.

(d) *Classification of attitude groups.* Further analyses were conducted ignoring the differences between the communities, but splitting the total sample into different attitude groups according to their degrees of opposition to, or acceptance of, various oil and nuclear developments. Regarding *oil* the sample was split three ways into those who were: (i) neutral or anti with respect to new oil wells both at Wytch Farm and elsewhere on the south coast; (ii) in favour of new oil wells either at Wytch Farm or elsewhere on the south coast; (iii) very pro new oil wells both at Wytch Farm and elsewhere on the south coast (i.e. with scores of 8 or 9 for each alternative). Regarding *nuclear* the following groups were generated: (i) opposed to new nuclear plants both at Winfrith and elsewhere in the UK (ANuc); (ii) opposed to a new nuclear plant at Winfrith, but not opposed to one elsewhere in the UK (LONuc); (iii) neutral or pro with respect to new nuclear plants both at Winfrith and elsewhere in the UK (PNNuc).

Characteristics of these six groups are shown in Table 3 and the contingency table relating the two classifications to each other is shown in Table 4. The association between the oil and nuclear attitude classifications was highly significant, $\chi^2(4) = 41.19, p < 0.001$; Kendall's tau (b ; $= 0.27, p < 0.001$).

The different attitude groups were then compared with respect to their ratings of the impacts during the construction and operation phases of the relevant development. Univariate analyses indicated significant linear trends across the three *oil* attitude groups on all 24 impacts (see Table 5), with significant deviations from linearity in terms only of the pollution effects of drilling, and the impacts on peace and quiet, health and safety, and disaster risk of oil well operation. There were significant linear trends across the three *nuclear* attitude groups on all 24 impacts (see Table 5) and also significant departures from linearity (differentiating those who were anti locally but not elsewhere (LONuc) from the remaining two groups) on all but three items: business/employment opportunities during both phases, and disaster risk during the construction phase.

Table 3. Characteristics of attitude groups (proximity study)

	Attitude to oil development			Attitude to nuclear development		
	Neutral/anti	Pro somewhere	Very pro anywhere	Anti anywhere	Anti locally	Neutral/pro anywhere
Percentage male	47.6	43.4	52.7	42.4	46.6	54.4
Percentage employed (if not retired)	55.4	53.8	65.5	52.4	57.1	64.7
Percentage retired	39.0	35.8	39.4	34.9	37.1	42.7
Percentage family nearby	45.5	58.7	54.3	48.1	58.4	52.7
Percentage Social Class I and II	53.7	50.0	53.5	45.1	52.9	57.7
Mean age	50.0	50.5	53.5	47.6	48.3	56.9
Mean years in area	18.1	23.0	24.9	18.8	19.4	26.0

Table 4. Association between oil and nuclear attitudes (frequencies) (Proximity study)

Attitude to nuclear development	Attitude to oil development		
	Neutral/anti	Pro somewhere	Very pro anywhere
Anti anywhere	62	37	32
Anti locally	35	34	20
Neutral/pro anywhere	27	47	78

Table 5. Expected impact of new oil wells (Proximity study)

	Phase					
	Drilling			Operation		
	Neutral/anti	Pro somewhere	Very pro anywhere	Neutral/anti	Pro somewhere	Very pro anywhere
1. Peace and quiet	3.5	4.3	4.8	3.7	4.5	4.9
2. Freedom to come and go	3.7	4.5	5.0	3.9	4.6	5.0
3. Effects on agriculture	3.5	4.2	4.8	3.7	4.4	4.9
4. Personal health and safety	4.0	4.9	5.2	4.0	4.8	5.1
5. Personal finances	4.8	5.1	5.5	4.8	5.1	5.5
6. Business/employment	6.1	6.6	7.3	6.0	6.4	6.9
7. Pollution	3.0	4.3	4.7	2.9	4.1	4.8
8. Amenities/services	4.9	5.4	6.0	5.1	5.5	5.9
9. Visual impact	3.0	3.9	4.8	3.1	4.0	4.9
10. Character of town/village	4.1	4.8	5.2	4.1	4.7	5.2
11. Tourism	4.3	4.9	5.6	4.2	5.0	5.5
12. Risk of disaster	3.1	4.0	4.7	2.8	4.0	4.6
<i>n</i> =	107	102	121	107	102	121

Note: Scale is 1 = very much for the worse; 9 = very much for the better.

Table 6. Expected impact of new nuclear power station (Proximity study)

	Phase					
	Construction			Operation		
	Anti anywhere	Anti locally	Neutral/pro anywhere	Anti anywhere	Anti locally	Neutral/pro anywhere
1. Peace and quiet	2.8	3.1	4.4	3.6	3.7	4.8
2. Freedom to come and go	3.6	3.6	4.8	4.0	4.1	4.9
3. Effects on agriculture	2.9	3.5	4.6	2.7	3.3	4.6
4. Personal health and safety	2.8	3.4	4.7	1.8	2.7	4.4
5. Personal finances	4.6	4.7	5.4	4.7	4.7	5.4
6. Business/employment	6.4	6.5	7.4	6.1	6.1	7.0
7. Pollution	2.7	3.0	4.5	1.8	2.5	4.2
8. Amenities/services	4.9	4.9	6.0	5.0	5.1	6.0
9. Visual impact	2.3	2.0	4.0	2.1	2.1	4.1
10. Character of town/village	3.5	3.3	4.8	3.4	3.3	4.9
11. Tourism	4.0	3.8	5.1	4.0	3.9	5.1
12. Risk of disaster	2.2	3.0	4.3	1.4	2.4	4.0
<i>n</i> =	109	79	128	109	79	128

Note: Scale is 1 = very much for the worse; 9 = very much for the better.

(e) *Discriminating nuclear attitude groups.* Two stepwise discriminant analyses were conducted on the data for the three nuclear attitude groups, using the method of maximizing the change in Rao's V. The first, on the construction impacts, yielded two functions, with the first accounting for 75.1 per cent of the shared variance and the second for 24.9 per cent. The first discriminated the three groups with the following canonical discriminant functions evaluated at group means: ANuc, -1.79; LONuc, -0.87; PNNuc, 2.06; the second with the corresponding scores ANuc -0.44; LONuc, -0.58; PNNuc, 0.73. The first function loaded most highly on disaster risk and business/employment opportunities, whereas the second loaded most highly on visual impact. The second, on the expected impacts once a new nuclear plant became operational, yielded two functions accounting for 79.9 and 20.1 per cent of the shared variance respectively. The two functions discriminate the three groups much as in the previous analysis (corresponding functions; ANuc, -2.53; LONuc, -1.01; PNNuc, 2.78; and ANuc -0.72; LONuc, -0.64; PNNuc, 1.01). The first function loaded most highly on personal health and safety, disaster risk and pollution, and the second on visual impact, followed by character of the town/village. Thus, on impacts relating to perceived danger, the 'locally opposed' group (LONuc) gave intervening scores between those who were neutral and pronuclear on the one hand and antinuclear on the other. However, the concern of the locally opposed group with impact on the visual environment was at least as strong as that shown by those who were antinuclear in general.

Discussion of 'Proximity Study'

This study showed some differences in attitudes towards oil and nuclear developments as a function of proximity of residence, even though all communities studied were, in absolute terms, quite close to *both* developments. Broadly, when considering the overall acceptance ratings, those living nearer to the existing oil installation at Wytch Farm are slightly less favourable, than those living further away, to the prospect of new oil development. However, both groups would somewhat prefer such a development locally than elsewhere on the south coast. The overall acceptance ratings for a nuclear power station show a different relationship to locality. This prospect of a new station at Winfrith is viewed somewhat negatively by both groups. However, whereas those living nearer Winfrith effectively said that they would prefer to see a power station built elsewhere in the region (at Hinkley Point), those living somewhat further away did not indicate such a preference.

The expectations of the impact of either development on aspects of local life showed a somewhat more straightforward effect due to proximity. Those living nearer Winfrith were more optimistic about the economic benefits, and more pessimistic about the environmental costs, of a new nuclear power station than those living nearer Wytch Farm, whereas the reverse was true with regard to the expected impact of a new oil development.

Overall, the prospect of new oil wells was viewed much more favourably than that of a new nuclear power station. With regard to the nuclear prospect, we found that a sizeable proportion of residents were opposed to a new plant in their own neighbourhood, but not to one elsewhere in the country, and that much of the motivation for such 'local opposition' was not specifically antinuclear, but more

concerned with factors such as the impact on the visual environment, as in the earlier findings reported by Eiser *et al.* (1988).

STUDY 2 ('FRAMING STUDY')

This was conducted at the same time as the 'Proximity' study, in April 1985. The main issue addressed was that of whether local attitudes and expectations concerning a new local nuclear plant were influenced by the possibility of a new oil well locally, and vice versa. This issue relates directly to Kahneman and Tversky's (1979) 'prospect theory' of decision-making. The main assumption of this theory (as distinct from expectancy-value models, for example) is that alternative prospects are evaluated by comparison to a pre-existing or subjective reference point, rather than as absolute end-states. In general terms this might mean that, say, the perceived incremental cost of a new industrial development (and hence its unacceptability) might be less in an already somewhat industrialized part of the country than in a part that had hitherto been less developed. Applied to the question of local residents faced with the prospects of a new nuclear plant and/or a new oil development, the issue is one of whether, for instance, the nuclear prospect is felt to be less objectionable if the oil development is anyway felt to be inevitable, or vice versa. If local residents were already reconciled to (or hopeful of) *some* major new local development, it could be that the prospect of both oil and nuclear developments going ahead would not be seen as very different in overall impact from that of one of these developments alone. However, if asked to consider either of these alone, residents might take the present status quo as their reference point against which to assess the implications of the proposed developments.

It should be stressed that we do not regard this as a strict test of prospect theory which, in its empirical applications, has been more concerned with the prediction that people tend to be risk-averse (controlling for expected value) when alternative prospects are framed in terms of gains relative to a given reference point, but risk-seeking when the same prospects are framed in terms of relative loss (Fischhoff, 1983; Meyerowitz and Chaiken, 1987). More modestly, we were simply using some of the concepts of prospect theory as a framework within which to formulate the questions for this research. The study to be described therefore compared attitudes and expectations both in response to 'unframed' or unconditional questions and in response to questions which were 'framed' in the sense of requiring respondents to consider the conditions of the *alternative* development proceeding or not proceeding.

Method

The sample consisted initially of 900 names drawn from the electoral registers of various wards in the town of Wareham in Dorset (which lies, as has been mentioned, approximately half-way between the Winfrith nuclear plant about 5 miles to the west and the Wytch Farm oil development about 5 miles to the east). Of these 900 names, 65 had moved or died by the time of our study, leaving 835 of whom 421 (50.4 per cent) responded to our questionnaire, either initially, or after a reminder some 3 weeks later. The sample included 198 males and 217 females (plus six who did not declare their sex) and the mean age was 46.4 years. There were six

versions of the questionnaire (each originally being sent to 150 names). These six versions constituted a 3×2 factorial design. The first factor (sources rated) had three levels and consisted of whether respondents were asked (1) only about the nuclear development, (2) only about the oil development, or (3) about both. The second factor (Framing) consisted of whether these questions were phrased in an unconditional or 'unframed' form (like in the 'Proximity' study) or in a 'framed' form, which was as follows (for the 'nuclear' items):

How do you feel about the *existing* nuclear power station at Winfrith?

How *would* you feel about a *new* nuclear power station at Winfrith:

(a) if there were also *definitely* going to be *new* oil wells around Wytch Farm? ('positively' framed);

(b) if there were *definitely* going to be *no new* oil wells around Wytch Farm? ('negatively' framed).

How *likely* do you think it is that a new nuclear power station will be built at Winfrith in the foreseeable future:

(a) if there were also *definitely* going to be *new* oil wells around Wytch Farm? ('positively' framed);

(b) if there were *definitely* going to be *no new* oil wells around Wytch Farm? ('negatively' framed).

Ratings were on nine-point scales from extremely opposed (1) to extremely in favour (9) and extremely unlikely (1) to extremely likely (9).

The 'oil items' were worded equivalently, with respondents rating 'new oil wells around Wytch Farm' contingent on there being (no) 'new nuclear power station at Winfrith'.

In addition, respondents were asked about their perceptions of the impacts of the relevant development(s) in the same terms as in the 'Proximity' study. The instructions, in the 'framed' conditions, asked respondents to assume that the other development *would* definitely be going ahead. These data, however, are not included in this report.

Results

For most analyses the items concerning oil and nuclear developments were considered separately (although when considered together a strong preference for oil over nuclear power was found, replicating the finding of the 'Proximity' study). This meant that levels 1 and 3 of the first factor (Sources rated) were used for analyses of the nuclear items, and levels 2 and 3 for the analyses of the oil items. The design also required separate comparisons *within* the framed conditions (is there a difference between 'positive' framing, i.e. if the other development were definite, and 'negative' framing, i.e. if there were to be definitely no other development?) and *between* the framed and unframed conditions.

The attitude ratings are summarized in Table 7 and the likelihood ratings in Table 8. The effects were assessed by means of the following analyses (separately for nuclear and oil items):

- (1) A multivariate analysis of covariance with unframed/positively framed attitude and likelihood ratings as dependent variables; the following three grouping factors—framed vs. unframed questions, only one vs. both energy sources rated and sex; and with attitude to the existing power station (or oil wells) as a covariate.

Table 7. Attitudes to local oil and nuclear developments (Framing study)

Attitudes to	Mean		Framing F	Present attitude F
(a) Existing nuclear station	5.47			
(b) New nuclear station	3.43			
(c) New nuclear station if new oil wells too	4.50	(b vs. c)	4.11*	226.81***
(d) New nuclear station if no new oil wells	4.87	(b vs. d) (c vs. d)	12.11*** 2.76	126.52***
(e) Existing oil wells	6.84			
(f) New oil wells	6.04			
(g) New oil wells if new nuclear station too	5.15	(f vs. g)	20.57***	322.37***
(h) New oil wells if no new nuclear station	5.96	(f vs. h) (g vs. h)	<1 12.23***	255.08***

* $p < 0.05$; *** $p < 0.001$

Note: Scale is 1 = extremely opposed; 9 = extremely in favour
n varies between 250 and 268.

Table 8. Perceived likelihood of local oil and nuclear developments (Framing study)

Attitudes to	Mean		Framing F	Present attitude F
(a) New nuclear station	6.03			
(b) New nuclear station if new oil wells too	6.40	(a vs. b)	1.49	<1
(c) New nuclear station if no new oil wells	5.74	(a vs. c) (b vs. c)	1.12 3.91*	<1
(d) New oil wells	7.71			
(e) New oil wells if new nuclear station too	7.15	(d vs. e)	4.29*	5.67*
(f) New oil wells if no new nuclear station	6.92	(d vs. f) (e vs. f)	6.74** <1	5.34*

* $p < 0.05$; ** $p < 0.01$

Note: Scale is 1 = extremely unlikely; 9 = extremely likely.
n varies between 250 and 268.

- (2) An equivalent analysis comparing unframed and negatively framed ratings.
- (3) Two multivariate analyses of variance, on attitude and likelihood ratings separately, within the framed conditions only, with positively and negatively framed ratings as dependent variables, and with two grouping factors: one vs. both energy sources rated, and sex.

Considering first the nuclear attitude ratings, attitudes to the existing plant strongly predict attitudes to a new plant in both the first two analyses, $F(1,239) = 226.81$, $p < 0.001$, and $F(1,240) = 126.52$, $p < 0.001$ respectively. In the first analysis the only other effect to achieve significance is that relating to the unframed vs. positively framed comparison, $F(1,239) = 4.11$, $p < 0.05$, indicating that the new nuclear plant

was rated less negatively under framed conditions. In the second analysis there was a significant tendency for ratings to be more negative when ratings of the oil development were also required, $F(1,240) = 4.13$, $p < 0.05$. The comparison between unframed and negatively framed conditions was rather stronger, $F(1,240) = 12.11$, $p < 0.001$, a result which is far from easy to interpret. The third analysis indicated that the difference between the positively and negatively framed prospects was non-significant.

The analyses of the oil attitude ratings show a somewhat more easily interpreted pattern. Attitudes to the existing oil wells strongly predicted acceptance of further oil development in the first two analyses, $F(1,257) = 322.37$, $p < 0.001$ and $F(1,256) = 255.08$, $p < 0.001$, respectively. In the first analysis the interaction between framing and one vs. two developments just attained significance, $F(1,257) = 4.03$, $p < 0.05$, but the more important effect was that of framing, $F(1,257) = 20.57$, $p < 0.001$. No effects other than that of the covariate were significant in the second analysis, whereas the third analysis indicated that the ratings were less positive if respondents were asked to assume that plans for a new nuclear power station would go ahead, $F(1,133) = 12.23$, $p < 0.001$.

The analyses of the likelihood ratings show fewer effects of any strength. With regard to ratings of the likelihood of a new nuclear plant, the only significant effect (and that only just so) is the difference within the framed conditions between the positively and negatively framed contingencies, $F(1,124) = 3.91$, $p < 0.05$, indicating that the nuclear plant was seen as more likely if the oil wells were also developed. As for the oil likelihood ratings, these were positively associated with approval of the existing oil development. Ratings were smaller under both positively and negatively framed than unframed contingencies, with no other significant effects.

Another way of considering the issue of how attitudes and expectations concerning one energy development depend on whether another will go ahead too is by considering respondents' own ratings of the likelihood of the alternative development. Restricting our attention just to the one of the six conditions where both energy sources were rated under 'unframed' instructions, we found a nonsignificant positive correlation between ratings of the likelihood of the two developments, $r(62) = 0.18$. When these data are combined with those of the respondents to the 'Proximity' study (who answered these same items), the figure is higher, $r(434) = 0.28$, $p < 0.001$. However, attitudes to a new nuclear plant are unrelated to the perceived likelihood of new oil wells either in the restricted or larger sample, $r(62) = -0.02$, $r(434) = 0.04$. The same is true for the relationship between attitudes to new oil wells and the perceived likelihood of a new nuclear plant: $r(62) = -0.16$, $r(434) = -0.02$.

Discussion of 'Framing' Study

This study does not provide entirely consistent evidence that residents' attitudes towards one energy development were systematically influenced by their consideration of the other. The results for attitudes to the new nuclear plant are especially confusing, in that a comparison of the unframed and positively framed responses suggests that acceptance of the new nuclear plant would be more acceptable in the context of new oil wells, whereas the comparison between unframed and negatively framed responses suggests the contrary. On the other hand, there is a somewhat clearer indication that the prospect of a new nuclear plant would make further oil development less acceptable.

This last result must be seen as troublesome for a 'prospect theory' approach, but only if it is assumed that respondents in the positively framed conditions were using as their subjective reference point an imagined situation in which the new nuclear plant was definite and the new oil wells still debatable (which was not the most plausible scenario in terms of the time scale for decisions by the relevant bodies). However, if, as seems likely, they were using the *present* situation as their reference point in both framed and unframed conditions, the question they were asked was effectively whether they would rather have two developments or one. On this point the findings suggest that an otherwise generally acceptable development (oil) becomes seen as somewhat less so when paired with one that is generally unwelcomed (nuclear).

This may mean that a nuclear plant may be seen by many local residents as the kind of development that, whatever its other actual or perceived benefits, has a negative impact on the immediate environment that approaches (and for many surpasses) a limit of tolerability. The prospect of additional environment exploitation, even of a form that otherwise would cause only relatively mild concern on average, may then be regarded with greater pessimism. On the other hand, the environmental threat posed by oil wells alone may on average be perceived as so much more tolerable that it has rather little impact on how the nuclear prospect is viewed.

GENERAL DISCUSSION

Taken together, these studies point to a strong preference by residents for the prospect of local oil rather than local nuclear development. If earlier research (e.g. van der Pligt *et al.*, 1986) concluded that much local opposition to nuclear power stations is not specifically antinuclear, the present data suggest that it does not reflect an indiscriminate objection to *all* forms of industrial activity.

Clearly the prospect of a new nuclear power station raises many issues that are less relevant in the case of oil development. One clear advantage held by the oil industry is that it does not have to present a general case for conducting their activities within a particular region rather than elsewhere (though obviously *how* they conduct their activities still needs justifying). The location of the Wytch Farm site is determined simply by the fact that that is where the oil is to be found. In comparison, a substantial body of local opinion may remain unconvinced that, even if more nuclear power stations are needed nationally, one has to be built in their own neighbourhood rather than elsewhere.

Our data indicate that local residents were far more concerned by the potential environmental and health hazards raised by nuclear power than by oil development, and they were also pessimistic about the impact that a new power station would have on the visual environment and on the character of their community. However, the prospect of new oil development still raised some degree of concern with respect to pollution and visual impact. In the case both of nuclear and oil development, the most important anticipated local benefit is that of business and employment opportunity.

In the first study there were differences on some variables related to whether residents lived in more built-up or more rural districts within the study area. Overall, the 'village' residents were somewhat more pro-oil and antinuclear than

the 'town' residents. Furthermore, even within the short range of distances considered, there were important effects due to proximity. Those living closer to Winfrith were more pessimistic about the safety risks and environmental damage, but also more optimistic about the economic benefits of a new nuclear power station than were those living further away. Conversely, those living nearer Wytch Farm were more optimistic of the benefits and more pessimistic of the costs of further oil development. In terms of the relative salience of local impacts, it seems that over the hill was far away.

With regard to the results of our 'framing' manipulation in study 2, we found little evidence that residents' attitudes towards either one of the proposed developments were influenced by the consideration of the other in a manner that could be consistently predicted from models of decision-making such as that of Kahneman and Tversky (1979). Whereas mentioning the prospect of oil (whether in 'positively' or 'negatively' framed conditions) seemed to have led to less opposition to nuclear development, the prospect of new oil wells was rated as less acceptable when respondents were asked to assume that the nuclear development would definitely proceed too.

In summary, therefore, our data show that residents had a far more positive view of the prospect of new oil development than of a new nuclear power station in their neighbourhood, and this was reflected in their expectations of specific impacts. The proximity of their homes to either of the proposed developments significantly influenced their expectations. There is also some evidence that attitudes towards the oil development were less positive if respondents were asked to assume that there would definitely be a new nuclear power station nearby. In short, different energy developments are evaluated very differently by local residents, but not necessarily independently of each other.

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