Prometheusplein 1
Postbus 98
2600 MG DELFT

Telefoon: 015 - 2784636
Fax: 015 - 2785673
Email: Helpdesk.doc@Library.TUDelft.NL

Datum: 08-apr-05

Bonnummer: 876325

Aan: UVA KEUR

BROERSTRAAT 4
9700 AN GRONINGEN
NEDERLAND

Tav:

Aantal kopieën: 8

Uw referentie(s): A078247411
UVA KEUR (UB GRONINGEN)

Artikelomschrijving bij aanvraagnummer: 876325

Artikel:
Auteur:
Tijdschrift: DUMMY TIJDSCHRIFT
Jaar: **Vol.** **Aflevering:**
Pagina(s): 189-196 **Plaatsnr.:**

LOCAL OPPOSITION TO THE CONSTRUCTION OF A NUCLEAR POWER STATION: RISK AND RATIONALITY(1)

J. RICHARD EISER[1], JOOP VAN DER PLIGT[2] & RUSSELL SPEARS[3]
[1]Department of Psychology, University of Exeter
[2]Psychological Laboratory, University of Amsterdam, The Netherlands
[3]Department of Psychology, University of Manchester

Introduction

The question of where or whether to build new nuclear power stations is frequently represented as a conflict between perceived national and local interests. In simple terms, it is commonly assumed that there is a national demand for a secure and economical electricity supply, but that most people would prefer such electricity to be generated elsewhere than in the vicinity of their own homes. Local opposition, though stronger or more organized in some countries than others (eg Marsh, 1981), has posed an increasingly troublesome and costly obstacle to the aspirations of the nuclear industry.

The problem is not peculiar to nuclear power stations. Other nuclear facilities such as waste reprocessing plants and disposal sites encounter similar antagonism, as indeed do plans for local disposal of other hazardous materials such as waste chemicals. In the United States, the Environmental Protection Agency (1979, p.3) went so far as to claim that, "if public opposition continues to frustrate siting attempts ... the national effort to regulate hazardous waste may collapse". Popper (1983), who cites this EPA report, proposes that nuclear plants, waste disposal sites, and many other development projects ranging from airports to prisons, be classified together under the heading of "Locally Unwanted Land Uses" or LULUs. He defines a LULU as a project that, "satisfies a strong non-local public need or private demand ... The difficulty is that its costs fall mainly on its locality or neighborhood. The asymmetry between costs and benefits, which is often inequitable ... sometimes cannot be rectified" (p 256).

Against this background, the attitudes of local residents towards such developments have been the target of much research and (eg Nealey, Melber & Rankin, 1983) quite an amount of more or less thinly disguised criticism. Particular frustration appears to be felt by nuclear planners and other developers towards those local opponents who seem to accept the case that new power plants or whatever are needed, but do not wish to have them locally. Lindell and Earle (1983) refer to this discrepancy between levels of support for nuclear power in the abstract or in the context of a specific local development as the "not in my back yard" syndrome, and identify it as a consistent feature of American opinion polls on this topic. In a study of residents of three villages in South-West England faced with the possibility of a new nuclear power station in the immediate vicinity, van der Pligt, Eiser & Spears (1986) found that twice as many people were, "very strongly opposed" to a new power station in their neighbourhood than elsewhere in the United Kingdom. From the perspective of the nuclear industry or its supporters, the

(1) This research was supported by a grant from the Economic and Social Research Council (No. DOO 250009) to the first author.

D. Canter et al. (eds.), Environmental Social Psychology, 189–196.

attitudes of such local opponents may appear inconsistent or selfish. However, one person's selfishness may be another's rationality, and the proper task of attitude research is to reveal the structure of the alternative rationalities that such debates imply.

To this end, the present study uses some of the data from a large-scale survey of community attitudes towards possible new nuclear power stations. The sample is the same as that studied by van der Pligt et al (1986), but the analyses to be reported discriminate between individuals specifically on the basis of their attitudes towards new nuclear power stations both locally and elsewhere in the country. We can thus try to identify some of the beliefs and values that differentiate, not simply supports and opponents of nuclear power, but also different kinds of opponents from one another.

Method

The historical and geographical context

In February 1981, the Central Electricity Generating Board (CEGB) announced the names of the five sites to be considered as possible locations for a new unclear power station in South-West England. In February 1982, the CEGB made an interim announcement that ruled out two of these sites (both in West Cornwall) on geological grounds. This left three sites on the short list: Bugle/Luxulyan in Cornwall, and Herbury and Winfrith in Dorset. All three sites were within a few miles of the coast (the Herbury site being practically at the water's edge) in areas that generally offer outstanding natural beauty and that consequently are popular for holidays and retirement. Apart from agriculture, there is local industry at Bugle in the form of a china clay works, and at Winfrith in terms of an atomic energy research establishment, with a small reactor. The present study is based on data collected in June 1982, after this interim announcement, but before the CEGB announced their final decision in August 1982. (This in fact made the new proposal of a third reactor at the CEGB's plant at Hinkley Point in Somerset as the next step, with the possibility of a single full-size reactor at Winfrith being retained as a future option. The general assumption is that any new reactors would be Pressurized Water Reactors).

Sample

A random sample (n=450) was drawn in equal proportions from the electoral registers of the three communities closest to the proposed sites - specifically the villages of Luxulyan, Langton Herring (for Herbury) and Winfrith Newburgh, and hamlets in their immediate vicinity. All lived within about two or three miles of the proposed sites. Of these 24 had died or moved, but of the remainder, 300 (70%) responded to a postal questionnaire either immediately, or after a reminder sent two weeks later. They were not required to pay for the cost of return postage. Since analyses reported elsewhere required follow-up questionnaires, 10 who responded anonymously were excluded. Of 285 who indicated their sex, 145 were male. Their average age was 47.5 and 63% owned their own home.

Questionnaire

The questionnaire contained eight pages, preceded by a covering letter explaining the purpose of the study, and the independence of the research team. The questions relevant to the present paper were as follows:

Personal details Respondents were asked their sex, age, how long they had lived in the general area, whether or not most of their family lived in the area, whether or not they owned their own home, whether or not they were employed and whether or not they were retired. Two questions required a response in terms of five categories, scored from 1 to 5 (yes definitely; yes probably; don't know; probably not; definitely not); these were "Could you (or the main "bread-winner" in your family) get a similar job elsewhere if you moved

away from the area?" and "Would (or does) having a nuclear power station nearby make you want to move away from the area?".

Attitudes to new power stations Respondents were asked to indicate in terms of seven categories scored from 1 to 7 (very strongly opposed; strongly opposed; opposed; neither for nor against; in favour; strongly in favour; very strongly in favour) how they personally felt about (i) "Building more nuclear power stations in the UK" and (ii) "A new nuclear power station in your neighbourhood".

Expectations of local impact Respondents were asked 30 questions concerning the possible impact of a new nuclear power station in their neighbourhood. Items A1 to A15 asked respondents to estimate how much life in their neighbourhood would be generally changed, "for the better or for the worse" as a consequence of particular aspects of the building or operation of a new power station. These may all be assumed to be inevitable features of such a development. The issue is how much they lead to good or bad changes. Items B1 to B15 were worded so as to deal with aspects of life locally that might or might not be expected to be benefited or compromised by such a development, so that respondents were asked how much they thought each aspect, "would be affected locally by the building and operation of a new nuclear power station in your neighbourhood". The full text of these 30 items is given in Table 2. For each item, respondents had to circle a number from 1 ("very much for the worse") to 9 ("very much for the better"); apart from 0 ("neither better nor worse") none of the other response categories bore verbal labels.

Results

We first categorized the respondents into four groups of comparable size on the basis of their self-ratings of attitude.
Group PN (pro/neutral) consisted of 73 individuals who were opposed neither to building more nuclear power stations in the UK nor to a new nuclear power station in their neighbourhood.
Group LO (locally opposed) included 68 who were not opposed to building more nuclear power stations in the UK, but were opposed to a new nuclear power station in their neighbourhood.
Group MO (moderately opposed) consisted of 66 who indicated that they were opposed to more nuclear power stations both in their neighbourhood and in the UK generally, but were less extreme than,
Group XO (extremely opposed) that included 83 who indicated they were "very strongly opposed" to more nuclear power stations both in their neighbourhood and in the UK generally.

There were some differences between the attitude groups in terms of demographic characteristics and perceived mobility, as shown in Table 1. Broadly, those who were least antinuclear were more likely to be male and employed, and were less likely to be retired, to own their own home or to have most of their family living in the area; they tended to be younger, and perceived their chances of getting a job elsewhere as greater, but were less likely to say that they would want to move away from the area if a power station were built nearby. It is interesting to note that group LO contained the highest percentage of owner-occupiers but the lowest percentage of those with strong family ties in the area.

Our main concern, however, was with how the four attitude groups differed in terms of the 15 items concerning how life in their neightbourhood would be affected by specific aspects of the building and operation of a new nuclear power station (A1 to A15), and the 15 items concerning specific local benefits or disadvantages of a new station (B1 to B15). Table 2 shows the means for each group on each item, and the univariate F-ratios for the

Table 1
Characteristics of the attitude groups

Percentages	PN	LO	MO	XO	N	$\chi^2(3)$	Tau(c)
% Male	56.8	58.2	46.9	42.5	285	5.12	0.14*
% Employed	60.3	56.7	55.6	45.5	280	3.68	0.12*
% Retired	20.5	29.9	28.1	40.0	284	7.03	-0.15*
% Owning own home	44.6	76.1	71.9	62.5	285	17.90***	-0.12*
% Family nearby	62.2	50.7	70.3	70.9	284	7.92*	-0.11*
Means[1]						F(3,N-4)	
Age	42.5_a	49.46_b	47.2_a	50.9_b	288	3.06*	
How many years in area	22.3	20.6	22.2	26.0	285	1.09	
Could get job elsewhere[2]	2.5_a	3.1_b	2.8_a	3.5_c	243	6.65***	
Would want to move if station built[2]	4.3_c	3.1_b	2.7_b	2.2_a	284	33.17***	

Notes: 1 Means within each row sharing same subscript do not differ significantly ($p<.05$) by Duncan multiple range test.

2 Response scale from 1 = Yes, definitely to 5 = Definitely not

* $p < .05$, *** $p < .001$

differences between the groups, based on a reduced sample of 262 with complete data on all these items. Particularly noteworthy is the fact that a majority of the items show a non-monotonic trend across the four groups, with the difference between groups LO and XO being less than that between groups MO and XO.

In order to consider these group differences on the 30 items in combination we performed a step-wise discriminant analysis (without rotation) using the method of maximizing the change in Rao's V. Limiting the number of variables entered into the analysis to 15 enabled 66.3% of the sample to be correctly classified, and yielded three functions as summarized in Tables 3 and 4. As may be seen from Table 3, the first discriminant function reflected a monotonic trend across the four groups, in particular discriminating group PN from the remainder. The second function essentially discriminates group LO from the remainder. The third function, accounting for only 3.4% of the shared variance, may be ignored.

The relationship between the discriminant functions and the individual items is shown in Table 3. All 15 items entered correlated positively with the first function. However, the standardized coefficients of the items suggest that this function can almost entirely be defined in terms of item B13 ("Your personal peace of mind"), which was entered into the analysis at the first step. This function may be regarded as a rather generalized "confidence vs . disquiet" dimension, with the more pronuclear subjects showing less disquiet or pessimism about local impact.

Table 2
Mean ratings of expected impacts by each group

	Impact	Group PN	LO	MO	XO	F(3,258)
A1	Excavation for pipelines	3.91	1.98	1.92	1.57	32.06
A2	Construction traffic	3.23	1.42	1.59	1.33	26.62
A3	Road building	5.44	2.53	2.39	2.04	32.65
A4	Conversion of land from agricultural use	3.54	1.81	1.37	1.26	41.80
A5	Noise of construction	3.66	1.78	2.03	1.58	30.22
A6	Workers coming into the area	5.81	2.02	2.73	2.23	43.99
A7	Noise of station in operation	4.41	2.86	2.92	2.28	23.10
A8	General appearance of the power station buildings	3.79	1.41	1.83	1.19	48.91
A9	Area of land fenced off	3.96	1.61	1.85	1.25	51.17
A10	Steam or water vapor from station when operating	4.10	2.14	2.22	1.54	41.76
A11	Increased security and policing	5.53	3.16	3.03	2.07	38.13
A12	Warming of nearby sea water	5.49	3.06	3.32	2.16	33.79
A13	Transportatuon of nuclear waste	3.37	2.03	1.32	1.19	32.79
A14	Overhead power cables/pylons	3.27	1.69	1.76	1.45	23.16
A15	Overall height of buildings	3.46	1.28	1.71	1.17	49.20
B1	Employment opportunities	7.89	5.80	6.54	5.68	26.13
B2	Tidiness of the village	4.76	3.27	3.02	2.68	18.00
B3	Standard of local recreational facilities	6.21	4.44	4.61	3.75	21.62
B4	Social life in the neighborhood	6.13	4.22	4.00	3.64	22.23
B5	Wild life	3.44	1.53	1.71	1.38	28.25
B6	Marine environment	4.23	2.41	2.19	2.14	19.81
B7	Farming industry	3.67	2.22	1.89	1.52	28.73
B8	Security of local electricity supplies	6.46	5.28	5.33	4.67	11.85
B9	Health of local inhabitants	4.60	2.55	2.58	1.81	41.15
B10	Landscape	3.30	1.19	1.73	1.14	38.28
B11	Holiday trade	4.47	2.67	2.71	2.04	24.27
B12	Business investment	6.26	4.55	4.63	3.71	17.85
B13	Your personal peace of mind	4.70	2.25	1.59	1.22	89.94
B14	Standard of local transport and social services	6.43	5.11	5.20	4.52	11.83
B15	*Standard of shopping facilities*	6.03	5.25	4.86	4.67	8.56
Mean		4.72	2.82	2.82	2.30	3.93[a]
N		70	64	59	69	
Mean of 5 important 'direct' impacts (A1 to A15)		3.88	1.26	1.47	1.12	61.98[b]
Mean of 5 important 'indirect' impacts (B1 to B15)		5.34	1.92	2.07	1.48	86.74[c]

(a) Pillai's Multivariate F with df = 90,693
(b) df = 3,242
(c) df = 3,224

Note: Scale from 1, 'very much for the worse' to 9, 'very much for the better'. All Fs are significant at p<.001.

Table 3
Stepwise discriminant analysis (no rotation, 15 items entered): Relation of Groups to Functions

	Groups	Canonical discriminant functions evaluated at group means PN	LO	MO	XO	Percentage of shared variance
Function	1	2.14	-0.49	-0.54	-1.26	85.1
Function	2	-0.09	0.83	-0.46	-0.29	11.5
Function	3	-0.09	0.07	0.41	-0.33	3.4

Table 4
Stepwise discriminant analysis (no rotation, 15 items entered): Relation of Items to Functions

Step	Items	Change in Rao's V	Standardized canonical discriminant function coefficients		Correlations between items and discriminant functions	
			Function 1	Function 2	Function 1	Function 2
1	B13 Peace of mind	269.8***	0.66	0.12	0.75	0.27
2	A15 Height	80.9***	0.21	-0.23	0.55	-0.29
3	B1 Employment	48.4***	0.28	-0.21	0.39	-0.30
4	A11 Policing	34.6***	0.28	0.15	0.49	-0.08
5	B9 Health	22.4***	0.06	0.51	0.47	0.55
6	A4 Land conversion	11.4**	0.18	0.19	0.51	0.14
7	B15 Shopping	9.7*	-0.23	0.26	0.23	0.16
8	B3 Recreation	9.0*	0.28	-0.14	0.37	-0.02
9	A5 Construction noise	8.6*	-0.12	-0.27	0.44	-0.16
10	A6 Workers	7.8	0.05	-0.39	0.52	-0.34
11	A13 Nuclear waste	7.8	-0.09	0.40	0.44	0.30
12	B2 Tidiness	7.6	-0.17	0.25	0.34	0.08
13	B10 Landscape	10.2*	0.10	-0.44	0.48	-0.32
14	A9 Fenced area	7.1	0.19	-0.00	0.58	-0.16
15	B5 Wild life	8.7*	-0.17	-0.08	0.42	-0.15

*** $p < .0001$; ** $p < .01$; * $p < .05$

The second function yields more interesting distinctions between the individual items. As reflected in both the standardized coefficients and the separate correlations, high scores on this function (as shown by group LO) were associated particularly with higher scores on items B9 and A13, but lower scores on items such as B10, A6, A5, A15 and B1. In other words, those residents who indicated that they were opposed to a new nuclear power station in their own neighbourhood, but were neutral or favourable towards new power stations elsewhere in the UK were distinguishable by their relative lack of concern for what may be thought of as specifically nuclear-related impacts ("Health of local inhabitants", "Transportation of nuclear waste"). On the other hand, they showed a particularly great concern for a number of specific aspects of environmental conservation vs. disruption ("Landscape", "Workers coming into the area", "Noise of construction", "Overall height of buildings"). They were also less convinced of the likelihood of a beneficial impact in terms of local employment opportunities. In short, those who were opposed to a new nuclear power station locally but not nationally appeared, in comparison to others, to base their opposition more on the expectation of immediate disruption and environmental damage that would be easily seen and heard rather than on less tangible fears of a potential nuclear catastrophe.

Discussion

These findings indicate that the four attitude groups differed widely in their perceptions of the likely impact of a new nuclear power station in their neightbourhood. On every one of the 30 items the most pronuclear group indicated that they expected the impact to be most beneficial or least damaging. However, on a majority of items the "locally opposed" group were more similar to the "extremely opposed" group than were those who were "moderately opposed". It it therefore revealing to consider the particular items

which allow one to discriminate between the groups in different ways.

Our research may be somewhat atypical in the relative lack of emphasis we have given to the concept of risk and risk perception. Nonetheless, items B13 ("Your personal peace of mind") emerges as the major predictor of overall pro vs. antinuclear attitudes (see also van der Pligt et al, 1986). It seems fair to conclude that many of our sample shared a generalized fear of nuclear power stations as potentially threatening and dangerous to some degree.

The literature on nuclear attitudes has tended to stress the importance of people's fears about nuclear accidents almost to the exclusion of other relevant considerations. Sometimes this carries with it the rider that such fears may be partly shaped by a limited cognitive capacity for appreciating the meaning of statistical information generally, and of low probabilities in particular (eg Slovic, Fischhoff & Lichtenstein, 1977; Nisbett & Ross, 1980). Taken further, this line of argument allows those who wish to do so to discount public fears about nuclear accidents as a product of flawed or irrational reasoning, rather than as a reflection of distrust of assurances of improbability. Even Popper (1983), who defends the reluctance of local residents to rely upon such assurances, still treats the problems as one of the perception of "low probability/high consequence" events. He argues that there may be political wisdom in refusing to calculate expected values by multiplying high consequences by low probabilities in the way many economists and others prescribe. However, he still seems to assume that the driving force behind local opposition to nuclear plants is the fear of a catastrophic accident.

Particularly in the aftermath of Chernobyl, our purpose is not to comment on whether people's fears of nuclear accidents are reasonable or exaggerated, but rather to question whether such fears were in fact the main basis for much of the opposition shown by local residents at the time of our study. Our questionnaire did not ask specifically about possible catastrophes, but concentrated instead on much more tangible eventualities. Many of these eventualities are not peculiar to nuclear power stations but would apply to any industrial development of comparable size. Indeed, as shown in the analyses reported by van der Pligt et al (1986), other industrial developments would also elicit strong opposition. The irony is that rural communities of the kind we studied could for the most part presume themselves to be safe from any large-scale non-nuclear industrialization. The policy (in Britain) of locating nuclear plants in coastal regions away from larger centres of population is manifestly guided by different principles from those on which planning decisions relating to most other major industrial or civil engineering projects would tend to be based.

Of particular relevance are the responses of the "locally opposed" group who were not in principle antinuclear. They anticipated some change for the worse as far as their personal peace of mind was concerned, but this was seen by them as no more serious than, for example, the threat to the local farming industry. Compared with the two other "anti" groups, they were somewhat sanguine about the health of local inhabitants and the transportation of nuclear waste (though the latter still prompted high levels of concern overall). The items on which these individuals showed greatest pessimism related to damage to the natural environment (eg landscape, overall height and appearance of buildings) and disruption to the tranquillity of their surroundings (eg workers coming to the area, construction traffic and noise). Moreover, perhaps because of their relatively privileged economic circumstances (over three-quarters owned their own home), they were relatively unconvinced that there would be substantial compensatory benefits in terms of local employment opportunities. There are implicit issues here concerning how different options for direct or indirect compensation might lead to changes in the distribution of attitudes of local residents.

This pattern of beliefs does not seem to derive in any obvious way from an "irrational" exaggeration of remote possibilities. It certainly reflects perceived self-interest, but before we characterize such self-interest as "selfishness", it is worth asking whether the environment that these individuals were at pains to protect may be more than merely a local asset, or the heritage simply of their own generation.

There seems a need, therefore, for both researchers and planners to avoid seeing nuclear power and similar issues in terms of simple dichotomies such as pro vs. anti or national vs. local. There is no single set of outcomes to be included in any cost-benefit analysis, nor any single set of reasons that can lead individuals to support or oppose a specific proposal. As Marsh (1981) argues, environmentalist causes appeal both to a kind of pre-industrial conservatism and to a post-materialist radicalism. When such systems of values combine with perceptions of personal self-interest, it is scarcely surprising that local opposition is not assuaged by assurances from the industry that nuclear plants are "as safe as houses". Even houses can be intrusive if they are built in one's own back yard.

REFERENCES

Environmental Protection Agency Office of Water and Waste Managemnent: Siting of Hazardous Waste Management Facilities and Public Opposition Washington, DC: EPA 1979.

Lindell, M.K. & Earle, T.C.: How close is close enough: Public perceptions of the risks of industrial facilities Risk Analysis, 3, 245-253 1983.

Marsh, A.: Environmental issues in contemporary European politics. in Europe's transition from oil London: Academic Press, pp 121-154 1981.

Nealey, S.M., Melber, B.D. & Rankin, W.L.: Public Opinion and Nuclear Energy Lexington, MA: Lexington Books 1983.

Nisbett, R.E. & Ross, L.: Human inference: Strategies and shortcomings of social judgement Englewood Cliffs, NJ: Prentice-Hall 1980.

Popper, F.J.: LP/HC and LULUs: The political uses of risk analysis in land-use planning Risk Analysis, 3, 255-263 1983.

Slovic, P., Fischhoff, B. & Lichtenstein, S.: Behavioural decision theory Annual Review of Psychology, 28, 1-39 1977.

van der Pligt, J., Eiser, J.R. & Spears, R.: Construction of a nuclear power station in one's locality: Attitudes and salience. Basic and Applied Social Psychology, 7, 1-15 1986.