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A COMPARATIVE ANALYSIS OF NETWORK
TELEVISION NEWS COVERAGE OF
NUCLEAR POWER, COAL, AND SOLAR STORIES

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A COMPARATIVE ANALYSIS OF NETWORK TELEVISION NEWS COVERAGE
OF NUCLEAR POWER, COAL, AND SOLAR STORIES

Topical Report

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EXECUTIVE SUMMARY

The purpose of this research was to analyze national television news coverage of nuclear power, coal power, and solar power issues to help gain an understanding about the information being presented about energy technologies that has been shaping public attitudes. ABC, CBS, and NBC news broadcasts from 1972 through 1977 were analyzed. A summary of the findings is presented below.

One category of analysis was the amount of prominence accorded the three different energy technologies. In general, coal stories were given the most prominence, nuclear power stories were given a little less prominence, and solar stories were given the least prominence. Probably of most importance here was the number of stories presented for each of the three technologies. Counting coal strike stories, coal stories numbered 463, while nuclear power stories numbered 266, and solar power stories numbered only 26. There were 254 non-strike coal stories. Coal stories were also begun significantly earlier in the news broadcasts than were nuclear power stories which were begun significantly earlier than solar stories. However, the amount of time allotted to the technology news stories did not differ as a function of energy technology.

A second area of analysis was news slant. While a large number of the stories presented the pro and con side of the technology story, virtually all one-sided solar stories were prosolar, and virtually all one-sided nuclear power stories were antinuclear. One-sided coal stories were about equally procoal and anticoal. In terms of whether the story seemed to promote or oppose a given technology, most solar stories were prosolar, while a majority of the nuclear power and coal stories were neutral. The remainder of the nuclear power and coal stories were somewhat evenly

divided between those that seemed to promote the technology and those that seemed to oppose the technology. Finally, in terms of the balance of the benefit/cost discussion, for solar power the benefit discussion outweighed the cost discussion about ten to one, while for nuclear power and coal the cost discussion outweighed the benefit discussion about four to one. The likely impact of these television news stories on an individual who was previously "neutral" about the three technologies would be for the individual to strongly support solar development, to remain neutral about coal, and to oppose nuclear power.

A final area of analysis was content of the news stories. The major areas of discussion differed for the three technologies. For coal, the major areas discussed dealt with the "front end" of the coal fuel cycle, namely coal mining and coal miner strikes. For nuclear power, however, power plant operation was the main area discussed. Discussions on laws, regulations, and licensing were major areas of discussion for both coal and nuclear power. Solar stories dealt primarily with solar heating and secondarily with solar methods of producing electricity.

The major issues discussed regarding nuclear power and coal were somewhat similar, but quite different from solar issues. Nuclear power and coal stories often dealt with political issues, health and safety issues, and, to a slightly lesser degree, economic issues. However, unlike nuclear power stories, a large number of coal stories also dealt with environmental issues, namely pollution and land reclamation. While the issue of energy supply was addressed in nuclear power stories as a need for nuclear power, the concept for coal addressed in connection with coal as an alternative energy source. This supply issue was addressed more often in coal stories than in nuclear power stories. The concept of solar as an alternative

energy source was the major theme in half the solar stories. Economics was also an important issue area, more so for solar than for nuclear power and coal. Economics was usually a minor issue in the solar stories--the economic point often made was that solar electricity, especially from certain sources, was still quite expensive.

Given the importance of nuclear waste management as a nuclear power issue area, the 86 nuclear power news stories that discussed waste management were subjected to further analysis. In general, television news stories about waste management did not distinguish whether the news story was about storage or disposal, whether the news story was about commercial or military wastes, or whether the news story was about low-level or high-level wastes. Also, these news stories most often focused upon unsolved technical problems, political issues, and health and safety issues. Also, even "insider expert" issues such as obligations to future generations, candor to the public, and the public's right to participate in the decision-making process were discussed in the news broadcasts, albeit infrequently.

INTRODUCTION

The purpose of this research is to analyze television news coverage of nuclear power, coal power, and solar power issues to help gain an understanding about the type of information about energy technologies that has been shaping public attitudes. This report complements two reports by Rankin, Nealey, and Montano (1978a, 1978b) that analyzed print media coverage of nuclear power and coal power issues.

Certainly, television and the print media are the two major news sources used by the general public. Nealey and Rankin (1978), in a mailout survey in 1977 to a random sample of Washington residents, asked respondents how much information they had received about nuclear power from eight different news sources. In general, the respondents used daily newspapers the most followed closely by television (the use of the two sources did not differ significantly). Nealey and Rankin (1978) also asked their respondents what was the best way for them to receive additional information about nuclear power. Again, daily newspapers and television ranked one and two, respectively, as the best ways to receive additional information about nuclear power. These data are quite consistent with Roper public opinion poll data that found that television is the chief source of news for the general American public (Epstein, 1973, p. 9).

Another means of looking at public reliance is to examine the number of viewers watching the three major television networks' daily news broadcasts. Epstein (1973) reports that in 1973 that an estimated 26 million viewers watched the CBS Evening News, that an estimated 21 million viewers watched the NBC Evening News, and that an estimated 10.5 million viewers watched the ABC Evening News. Thus, there is no doubt that the public relies somewhat heavily on television as a general, and, consequently, nuclear power, news source.

How much trust does the public have in television as a nuclear power news

source? Television seems to be the most generally trusted news source (see Greenberg and Roloff, 1974, for a review of this literature). Complementary evidence collected specifically about trust in nuclear news sources upholds this general conclusion.

Louis Harris and Associates, Inc., conducted national surveys on nuclear power in 1975 and 1976. Respondents were asked to choose the one media source that they "trust most in reporting the facts on nuclear power development impartially and not slanted." Averaging across the two surveys, 25.0 percent trusted "network television news" the most, 21.5 percent trusted "news magazines" the most, 15.5 percent trusted "daily newspapers" the most, 14.5 percent trusted "television in general" the most, 5.0 percent trusted "magazines in general" the most, 4.0 percent trusted "radio" the most, and 14.5 percent were not sure. Thus, about 40 percent of the respondents placed most trust in television as a reliable news source with much of that trust placed on the news programs.

Nealey and Rankin (1978) asked respondents to agree or disagree with four attitude items, "I can really trust the information about nuclear power provided by government agencies [the news media, environmental groups, or utility companies]." On the average, respondents slightly distrusted all four sources. However, they distrusted government sources the least, followed closely by the news media.

As a final indication of the amount of trust that the public places in the news media, a question asked by the Becker Research Corporation in 1973 (see Melber, Nealey, Hammersla, and Rankin, 1977) to a national probability sample is also available. Respondents were asked to agree or disagree with the statement: "The news media including radio, television, and newspapers always give front page coverage to every little problem that occurs at a nuclear plant and never gives [sic] any mention to them when they are running as usual." About 33 percent of the respondents "strongly agreed," 29 percent "agreed but not strongly," 21 percent had "no opinion," 11 percent "disagreed but not strongly," and 6 percent

"strongly disagreed." Thus, about 62 percent of the national public felt that the media give biased coverage to nuclear-related events,

Thus, the Harris (1975,1976) and Nealey and Rankin (1978) findings suggest that television is an important shaper of public attitudes regarding nuclear power. However, the Nealey and Rankin (1978) and Becker Research Corporation findings suggest that the public perceives biased coverage of nuclear power issues, likely in an antinuclear direction. Certainly, members of the nuclear industry would agree with this latter position, as was exemplified by the nuclear industry reaction to a January, 1977, NBC television documentary entitled "Danger! Radioactive Waste."

However, "bias" is a hard term to define and harder still to prove. There have also been claims of a pronuclear media bias, at least with regard to newspaper (non)coverage of nuclear power issues (Devereux 1976; Shapley 1977). Recent work by Rankin et al. (1978a, 1978b) has taken a different research tact with regard to understanding media leanings on issue coverage. This research has involved content analysis of important aspects of print media nuclear and coal articles, such as article prominence (type of article, location, and length) and article content, as well as judgments about the ratio of the discussion of benefits and costs of the technology and judgments about the likely effect the article might have on a neutral reader. Comparisons of article characteristics across technologies then allow statements about the relative differences in media handling of different energy technologies that supplements the article information specific to nuclear power.

Thus, the purpose of this research is to analyze the major network television news broadcasts (ABC, CBS, and NBC) to determine what types of information about nuclear power, coal, and solar power are reaching the public. Nuclear power stories will be compared to coal and solar power stories to determine if these energy technologies are handled in the same fashion by the television networks.

Findings from Nealey et al. (1978b) suggest that coal will be handled in a less prominent, more neutral, manner than nuclear power and that nuclear power stories will tend to be slightly more antinuclear. Although comparative data regarding solar power do not exist, the finding reported by Melber et al. (1977), that over 82 percent of the public in 1976 believed that the United States should speed up the development of solar power, suggests that solar power will be handled in a prominent, prosolar manner.

METHOD

Choice of Media Sources

Since 1968, staff of the Television News Archives at Vanderbilt University has videotaped all the evening news broadcasts of the three major television networks (ABC, CBS, and NBC). Since 1972, in addition to videotaping, the archive staff has indexed and abstracted all of the news broadcasts. Therefore, we had video tapes made of all nuclear power, coal, and solar power news stories broadcast over the three major networks from January, 1972, through December, 1977. However, because of time limitations and the large number of coal stories, all of the coal stories were not content analyzed. Coal stories that were mainly about strikes were content analyzed, and half of the remaining coal stories were content analyzed (every other nonstrike story was analyzed).

Analysis Procedure

Content analysis was used as the analysis procedure. Content analysis was chosen because it involves collection of quantifiable data using raters with known measurement reliability, and because it was the technique used in our previous research on print media handling of nuclear power and coal issues (Rankin et al., 1978a, 1978b).

While many of the content judgments made were relatively straightforward (such as the broadcast day and date), others were less so (such as the judgment as to whether the story seemed to promote or oppose the energy technology). Therefore, two content analysts worked together for the entire analysis, so that judgements were made on a consensus basis. Using two judges rather than one should decrease the chances of personal biases and, therefore, make the data more valid and possibly more reliable.

Two types of reliability checks are important to make during a content analysis. The first is interrater reliability, which refers to the ability of two or

more judges to rate the articles the same. Accordingly, both judges were asked to separately content analyze 20 news stories at the beginning of the analysis (see Table 1). As will be discussed more fully in the Areas of Analysis section, the interrater reliability was good, high enough to allow the study to proceed.

The second type of reliability, intrarater reliability, is the ability of the same rater, analyzing the same articles at two different points in time, to produce the same results. Since the basis of our analysis was the consensus judgment of two raters, these two raters analyzed 30 news stories for a second time also on a consensus basis (see Table 1). A comparison of these two consensus judgments served as the check on intrarater reliability.

The interrater and intrarater reliabilities will be discussed in the following Areas of Analysis section along with the actual areas that were content analyzed. In this way the reader can simultaneously get an understanding of the rationale for doing each judgment and of how reliable the individual judgments are.

Areas of Analysis

Network and date. The television network (ABC, CBS, or NBC) was recorded, along with the news date (day, month, and year) and the day of the week. These data were not checked for reliability because of the straightforward nature of the rating--the network and news date were continually run on the periphery of the videotape and the day of the week was determined from an almanac.

Time. The start of the report into the 30 minute news broadcast was recorded in minutes (this rating was also taken directly from the videotape), and the air-time allotment for the report was calculated to the nearest five seconds (also determined directly off the videotape). If the technology that we were interested in (nuclear, coal, or solar) was a part of a larger umbrella story, the air-time

TABLE 1

Interrater and Intrarater Reliability

Article Characteristics	<u>Interrater Reliability</u>		<u>Intrarater Reliability</u>	
	Agreement	Percent	Agreement	Percent
News Source				
Event	18/20	90	22/30	73
Person/Group	19/20	95	25/30	83
Network background	18/20	90	27/30	90
Commentary	20/20	100	30/30	100
Continuation of Previous Story?	20/20	100	29/30	97
Story Context	20/20	100	28/30	93
Location				
Studio Only	20/20	100	28/30	93
International	20/20	100	30/30	100
Washington, D.C.	20/20	100	29/30	97
National	20/20	100	27/30	90
Symbolism				
None	19/20	95	30/30	100
Danger Radioactivity	20/20	100	30/30	100
Atomic Symbol	19/20	95	30/30	100
Mushroom Cloud	20/20	100	30/30	100
Energy Symbol	20/20	100	29/30	97
Impact on Neutral Reader				
Five-Category Rating	16/20	80	20/30	67
Three-Category Rating	17/20	85	24/30	80
Both Sides of Issue Presented?	13/20	65	26/30	87
Benefit/Cost Discussion				
Six-Category Rating	12/20	60	18/30	60
Four-Category Rating	14/20	70	20/30	67
Main Area	19/20	95	25/30	83
Main Issue	15/20	75	25/30	83

allotments for the whole story and for the part of the story that dealt with the technology of interest were recorded separately. Reliability measures were not calculated for these measurements.

Originating source. We judged the (probable) reason why each report was carried by the network. The report may have been carried for several reasons: (a) a report of an actuality or event, (b) a person or group persuaded a newsperson to consider as newsworthy something that they were going to say (e.g., called a news conference), (c) the network considered the issue important enough to keep background information about the issue on hand so as to use on the news broadcast as time permitted, and (d) the issue was important enough to call for a network commentary (always specifically labeled as such).

It was possible that a story was carried for more than one reason. Thus, the four categories were not mutually exclusive. The interrater reliabilities for these four categories were quite high, ranging from 90 percent to 100 percent (see Table 1). Intrarater reliabilities, however, were lower, ranging from 73 percent agreement on reports of actualities or events to 100 percent for commentary. Evidently the distinction as to what constitutes an event was relatively hard to make. Still, all categories showed relatively high interrater and intrarater reliabilities.

Continuation of a previous story. On the theory that more important issues will receive continued news coverage by the network, a rating was made as to whether a news story was a continuation of a previous news story. Because of the way in which the news stories were recorded on the videotape, the "continuation" ratings were highly reliable--100 percent interrater reliability and 97 percent intrarater reliability.

Story content. Most often the technology (nuclear, coal, or solar) that we were interested in constituted the total news story. Other times there was

a larger "umbrella" story under which the relevant technology was discussed either as a major aspect or a minor aspect of the umbrella story. A rating was made of this with high interrater reliability (100 percent agreement) and with high intrarater agreement (93 percent agreement) (see Table 1). If there was an umbrella story, we rated whether the main thrust of the umbrella story dealt with energy needs, the energy crisis, energy costs, the environment, or health effects of energy technologies.

Location. A determination was made as to whether the news story was presented only by reporters located in the network studio, or whether film footage was shown that depicted events outside the studio. We theorized that news reports that included more than a report by a studio reporter were more prominent than "studio only" news stories. Thus, ratings were made as to whether the location was (a) "studio only," or whether it had film that was (b) from Washington, D.C., (c) from the United States other than Washington, D.C., or (d) from international locations. The interrater reliability was 100 percent for the four locations and the intrarater reliability ranged from 90 percent to 100 percent agreement (see Table 1).

Symbolism. The graphic symbolism used by television networks can be used to influence viewer's attitudes about a given news story. As stated by Epstein (1973, p. 5), "If over long periods of time the same type of symbols are consistently used to depict the behavior and aspirations of groups, certain stable images. . . can be expected in television news." These images are often readily identifiable objects with emotional appeal, such as the "danger radioactivity" symbol. Therefore, the different symbols used for the three technologies (nuclear, coal, and solar) were coded for each story. This rating was highly reliable with interrater and intrarater reliability ranging from 95 percent to 100 percent.

News slant. One of the more important areas of analysis was whether the technology was largely presented in a positive or negative fashion. Several different ratings were made in an attempt to determine how the news was presented. First, the news stories were rated as to the probable impact of the story on a neutral viewer. A five-point scale was used that allowed a rating as to whether the impact of the story on a neutral reader would be to: (a) strongly promote the technology, (b) slightly promote the technology, (c) neither promote nor oppose the technology, (d) slightly oppose the technology, or (e) strongly oppose the technology. The interrater reliability for this five-point rating was 90 percent and the intrarater reliability was 67 percent (see Table 1).

"Errors" for this rating could be of several types--e.g., a story rated "strongly promote" at one time could be rated "slightly promote," "neutral," or "oppose" at a different time. Conceptually, a rating of "strongly promote" at one time and "slightly promote" at the second time is not as serious an "error" as a rating of "neutral" the second time, which is not as serious as a "slightly oppose" or "strongly oppose" rating the second time. Therefore the two "support" ratings were collapsed to form a single "support" rating and the two "oppose" ratings were collapsed into a single "oppose" rating, thus allowing for a three-category judgment. For the three-category rating the interrater reliability was 85 percent and the intrarater reliability was 80 percent. Thus, some of the differences in rating were a matter of degree. None of the "errors" were from rating a news story as "promote" at one time and "oppose" at a second time, or vice versa, but instead were from rating "neutral" at one time and "promote" or "oppose" at another. Thus, although relatively speaking the reliabilities were of lower magnitude than for the previous measures, they were judged to be high enough to allow confidence to be placed in the measures.

A second rating was made as to whether both sides of the issue were presented in the news story. The ratings were: (a) not applicable, (b) yes, (c) no, protechnology side only, and (d) no, antitechnology side only. Although the interrater reliability was only 65 percent for this measure, the intrarater reliability was very good with 87 percent agreement (see Table 1).

After determining whether both sides of the issue had been presented, a determination was made as to who presented the pro or con side. These spokespersons included 12 groups of individuals: anchorman, field reporter, studio reporter, science editor, commentator, scientist, elected government official, government agency official, industry or utility spokesperson, national organization spokesperson, local organization spokesperson, and unaffiliated citizens.

The final rating made to help determine the slant of the news was a rating regarding the relative discussion of benefits and costs of the technology. Six rating categories were used to indicate whether the story discussed: (a) only benefits, (b) more benefits than costs, (c) benefits and costs about equally, (d) more costs than benefits, (e) only costs, or (f) not applicable (used where a benefit/cost discussion was not appropriate, such as for a news story that simply reported a nomination to an agency). The interrater and intrarater reliabilities for this category were both 60 percent. But, as with the "promote/oppose" ratings, some "errors" are more serious than others. Thus, (a) and (b) from above were collapsed into one rating, as were (d) and (e). For the four-category rating, the interrater reliability was 70 percent and the intrarater reliability was 67 percent. Most of the "errors" came from rating something as discussing "benefits and costs

about equally" one time and "more benefits than costs" or "more costs than benefits" the second time. Thus the errors were not of the most serious kind, and the data are still meaningful, but the lower reliability percentages indicate that not quite as much confidence can be placed in this rating as can be placed on the other ratings.

Areas and issues. A final task of the analysis was to determine which areas of the nuclear (coal, solar) fuel cycle were being discussed in the news story and what specific issues were being discussed with regard to these fuel cycle areas. In content analyzing the stories, we also wished to differentiate the most prominent area and issue discussed from other areas and issues that were also discussed. Therefore, the most prominent area and the most prominent issue were coded a "2," and other areas and issues that were mentioned were coded a "1," and areas and issues that were not mentioned were coded "0." Since, for reporting purposes, our major concern will be with regard to the main areas and issues discussed (i.e., those that were coded "2"), our reliability check was made only on the main areas and issues (see Table 1). The interrater reliability for the main area was 95 percent and for the main issue was 75 percent. The intrarater reliability for both measures was 83 percent. Most of the differences in judgment for issue ratings came when trying to differentiate between safety-related issues and health-related issues. Thus, these two categories were combined for discussion purposes in the results section.

Nuclear waste management. Because of the importance of nuclear waste management as a public issue, news stories dealing with nuclear waste management were given special consideration. Whenever a story dealt with waste management, it was rated as to the type of management (temporary storage, permanent disposal, both, or not specified), the type of waste (military, commercial, both, or not specified), the amount of radioactivity

(high-level waste, low-level waste, both, or not specified), and the issues mentioned specifically with regard to nuclear waste management.

RESULTS

News Story Prominence

Number of news stories. A total of 266 nuclear power news stories were broadcast by the three major network television news stations from 1972 through 1977. Of these, 69 were from ABC, 114 were from CBS, and 83 were from NBC. Coal stories were more numerous. Since our procedure for coal was not to analyze any of the strike stories and only half of the remaining stories, only 127 coal stories were content analyzed. However, the total number of coal stories was 463--this includes 209 strike stories (not analyzed) and 254 non-strike stories (half of which were not analyzed). Of these 463, ABC broadcast 60 strike and 78 non-strike stories (ABC total of 138); CBS broadcast 67 strike and 96 non-strike stories (CBS total of 163); NBC broadcast 82 strike and 80 non-strike stories (NBC total of 162). Solar stories were, by far, the least numerous with only 26 stories total. Of these 26, 11 were broadcast by ABC, 9 were broadcast by CBS, and 6 were broadcast by NBC. Thus, coal was given the most coverage (although a large portion dealt specifically with strike issues) followed by nuclear power, with solar coverage a distant third.

Not only do the number of news stories dealing with the three technologies differ, the pattern of the number of stories across the six years of analysis also differs (see Figure 1). The number of nuclear power stories increased steadily and almost geometrically from 1972 through 1977. However, the total number of coal stories (strike and non-strike) peaked in 1974, dropped in 1975 and 1976, and then rose again in 1977. This was largely due to the coal strike coverage in 1974. For non-strike coal stories only, the peak came in 1977. Finally, the number of solar stories peaked in 1975 with some resurgence in 1977.

Figure 1

Number of Nuclear Power, Coal, and Solar News
Stories by Year

Time. Several of our measures were meant to give a reading on the prominence accorded to the different news stories. Two such measures were the time into the broadcast when the story began and the length of the story. Time is an especially important commodity for news broadcasters, since only 22 minutes are available each broadcast for news presentation. It is possible that the three networks could differ in the time allotted to a news story or on the time into the broadcast when the energy news story began. It is also possible that the three technologies were handled differently by the networks. Therefore, a two-way analysis of variance (Network X Technology) was run separately on each of the two dependent variables (time into broadcast when story began and total time allotted to the news story) to determine whether: (a) there was an interaction between networks and technology; (b) there was a difference among networks in the handling of energy technology stories in general; and (c) there was a difference in the way the three technologies were handled.

Regarding the time into the news broadcast when the energy technology story began, the interaction between technology and network was not significant [$F(4,410)=1.013$, $p>.05$]. Also the main effect of network was not significant [$F(2,410)=0.617$, $p>.05$], i.e., the networks, on the average, started their energy technology stories at about the same time into the broadcast. However, the main effect of energy technology was significant [$F(2,410)=3.91$, $p<.05$], i.e., on the average, news stories started at different times into the news broadcast as a function of the type of technology (see also Table 2). On the average, coal stories were begun earlier in the broadcast (an average of 13.2 minutes into the broadcast) than were nuclear energy stories (14.8 minutes), which were begun earlier than solar stories (16.3). On the average, the energy technology

stories were begun somewhat late into the news time. In terms of this measure, coal stories were given the most prominence followed by nuclear energy followed by solar.

The second variable was how much air time was allotted to the stories. The Technology X Network interaction was not significant [$F(4,410)=1.34$, $p>.05$], nor was the main effect of technology [$F(2,410)=0.25$, $p>.05$]. However, there was a small effect [$.05<p<.10$] as a function of network [$F(2,410)=2.69$, $p<.07$]. CBS tended to spend the least amount of time on energy technology news stories (an average of 70.7 seconds), ABC used an intermediate amount of time (78.7 seconds), and NBC gave the longest coverage to energy technology stories (91.4 seconds). Thus, using air-time allotment as a measure of prominence, the three energy technologies were accorded the same amount of prominence.

Originating source. In some cases, the originating source of the news story is also a measure of the prominence accorded to the story. For instance, news commentaries would be an indication of issue prominence. However, news commentaries were rare (4 for nuclear power, 2 for coal, and 0 for solar) and did not differ among technologies (see Table 2). Also, if the networks kept a background story on a technology in order to use it when time allowed, this would be an indication of prominence. A number of the news stories were network background stories (25.9 percent of the nuclear stories, 36.2 percent of the coal, and 42.3 percent of the solar), and the percentages differed significantly among energy technologies. More solar and coal stories and less nuclear stories than expected were network background stories. The networks seem to be educating the viewing audience about solar power.

If a person or group was the originating source of the news story (for example, by calling a news conference), this would be an indication of prominence. In this case, there was a significant difference among energy technologies. Using this measure, nuclear power stories were more prominent (30.8 percent were originated by a person or group) than solar (23.1 percent) and much more prominent than coal stories (8.7 percent). This seems to indicate that it is easiest to get air time for nuclear power issues than for coal or solar issues.

The final category for originating source was an event, i.e., whether the news story was a report of an event. Here, prominence is not easy to determine, because the number (or percentage) of event-oriented stories is likely a function of the number of technology-related events occurring. Regardless of the interpretation, coal stories were, by far, the most event-oriented (70.9 percent) followed by nuclear power (56.8 percent) followed distantly by solar power (38.5 percent), and these differences are significant. What seems most obvious here is that not many solar power events have occurred.

A further indication of story prominence is whether the news story is a continuation of a previous story. Here, a continuation would indicate more prominence because the networks either considered the story important enough to follow up on it or considered the story important enough to make a series of reports out of it. There was a significant difference among technologies on news story continuation (see Table 2). The main reason for the significant difference was that more coal stories than expected were a continuation of a previous coal story. This measure, then, indicates more prominence accorded to coal.

Context. Another measure of prominence was the context within which the energy technology story was presented. By context we mean here whether

Table 2

A Comparison of the Prominence Accorded to
Television News Stories Regarding Three
Energy Technologies

Prominence Categories	Energy Technology			p^a
	Nuclear Power	Coal	Solar	
Start of technology story into news time				
0-9 minutes	60 (22.6%)	40 (31.5%)	5 (19.2%)	
10-19 minutes	139 (52.3%)	67 (52.8%)	10 (38.5%)	
20-29 minutes	67 (25.2%)	20 (15.7%)	11 (42.3%)	.05 ^b
Average	14.8 min.	13.2 min.	16.3 min.	.05 ^c
Air-time allotment for news story				
0-15 seconds	34 (12.8%)	20 (15.7%)	10 (38.5%)	
16-30 seconds	101 (38.0%)	41 (32.3%)	4 (15.4%)	
31-60 seconds	25 (9.4%)	4 (13.8%)	0 (0.0%)	
61-120 seconds	40 (15.0%)	24 (18.9%)	4 (15.4%)	
121-180 seconds	36 (13.5%)	26 (20.5%)	4 (15.4%)	
Over 180 seconds	30 (11.3%)	12 (9.4%)	4 (15.4%)	d
Average	77.3 sec.	83.5 sec.	79.0 sec.	n.s. ^c
Originating source				
Report of event	151 (56.8%)	90 (70.9%)	10 (38.5%)	.001 ^b
Person or group	82 (30.8%)	11 (8.7%)	6 (23.1%)	.001 ^b
Network background	69 (25.9%)	46 (36.2%)	11 (42.3%)	.05 ^b
Commentary	4 (1.5%)	2 (1.6%)	0 (0.0%)	d
Continuation of earlier story?				
Yes	38 (14.3%)	31 (24.4%)	2 (7.7%)	
No	228 (85.8%)	96 (75.6%)	34 (92.3%)	.05 ^b
Context				
Total story about technology	238 (89.5%)	105 (82.7%)	17 (65.4%)	
Umbrella story with technology story a major part	9 (3.4%)	3 (2.4%)	2 (7.7%)	
Umbrella story with technology story a minor part	19 (7.1%)	19 (15.0%)	7 (26.9%)	.01 ^b
Location ^e				
Studio only	149 (56.0%)	45 (35.4%)	12 (46.2%)	
International	8 (3.0%)	0 (0.0%)	1 (3.8%)	
Washington, D.C.	31 (11.7%)	22 (17.3%)	2 (7.7%)	
National (other than D.C.)	85 (32.0%)	67 (52.8%)	11 (42.3%)	.01 ^b

^aThe probability (p) that the observed differences were not simply due to random variation. Probabilities of .05 or smaller are considered statistically significant; "n.s." stands for "not significant."

^b χ^2 test of independence.

^cAnalysis of variance (F) test of significance.

^dExpected number of cases in some cells are too small to permit χ testing.

^eThe subcategories in this prominence category are not mutually exclusive, i.e., the column percentages can add to more than 100 percent.

(a) the total story was about the energy technology, (b) the total story was an umbrella story with the technology of interest as a major part, or (c) the total story was an umbrella story with the technology as a very minor part (see Table 2). The more often the total story is about just one technology, the more prominent the technology. Or, conversely, the more often the technology is a minor part of an umbrella story, the less prominent the technology. Using this measure of prominence, nuclear power stories were the most prominent and solar stories the least prominent with coal stories in an intermediate position. Here, for the nuclear power, coal, and solar stories, respectively, 89.5 percent, 82.7 percent, and 65.4 percent were totally about the given technology, while, respectively, 10.5 percent, 17.4 percent, and 34.6 percent discussed the technology as one aspect of a larger energy umbrella story. Thus, solar power, compared to nuclear power and coal, is most often discussed in conjunction with other energy technologies.

A question related to story context was what was the major theme of the umbrella stories. Of the 59 news stories that were umbrella stories, 26 (44.0 percent) were about energy needs (13 nuclear, 7 coal, and 6 solar); 13 (22.0 percent) were about the energy crisis (3 nuclear, 9 coal, and 1 solar); 5 (8.4 percent) were about energy costs (2 nuclear, 3 coal, and 0 solar); 3 (5.0 percent) were about energy and the environment (2 nuclear, 1 coal, and 0 solar); and the remainder of the umbrella stories were about other themes.

Location. A final measure of prominence that was analyzed was the location of the news story. If a story took place in the studio only, with no film footage, this story was felt to have less prominence than a story that had film footage from Washington, D.C., from other national locations, or from international locations (see Table 2). Using this criterion, coal stories were given the most prominence (64.6 percent contained film footage from outside the studio), solar stories were in an intermediate position (53.8

percent contained film footage), and nuclear stories were the least prominent (44.0 percent contained film footage). The low nuclear prominence on this measure may be a function of fewer nuclear events, compared to coal, or a function of person or group origination of much of the nuclear news.

Summary. It appears that coal stories were given the most prominence by the television news broadcasts, that nuclear power was given a little less prominent display, and that solar stories were given the least prominence. Probably the major indicator of news prominence was number of stories broadcast. If coal strike stories are included, coal stories outnumbered nuclear power stories 463 to 266. Excluding coal strike stories, the number of coal and nuclear stories was about the same--254 coal and 266 nuclear power. Solar was a distant third with only 26 stories in all from 1972 through 1977.

In terms of the other prominence measures, coal stories again seemed to be given the most prominence followed by nuclear power followed by solar. Coal stories were begun significantly earlier in the news broadcast than were nuclear power stories which were begun significantly earlier than solar stories. Coal and solar stories originated as network background material more often than nuclear stories; coal stories were more often a continuation of previous news stories than were nuclear power and solar stories; and more of the coal stories were filmed on location than were nuclear power and solar stories. On the other hand, nuclear power stories more often originated from a person or group source than solar and coal stories, and nuclear power stories were more likely not to be included in an umbrella energy story compared to coal and solar stories. Taking these measures in the aggregate, however, leads to the conclusion that of the three energy technologies, coal received the most prominence from 1972 through 1977.

News Slant

Both sides of issue presented. Several different ratings were made to help determine whether, in general, a pro or anti slant was given to the totality of news stories regarding a given energy technology. First, a determination was made as to whether both sides of the issue were presented in the news story, or whether the story was "one sided" (see Table 3). In some cases, an issue was not being presented (for example, a nomination to a board or government agency might simply be announced as the news item), so that a "not applicable" rating was made. For other stories, both the pro and the anti side of the issue may have been presented or only the pro side or only the anti side may have been presented.

On this measure there was a large difference in how nuclear power, coal, and solar stories were handled ($p < .001$). As Table 3 shows, virtually all one-sided solar stories were prosolar while about 90 percent of the one-sided nuclear stories were antinuclear. One-sided coal stories were about equally procoal and anticoal.

A follow-up question to this rating dealt with who presented the side(s) of the issue (see Table 4). The major presenters of the protechnology side of the issue were the field reporters (71 times), the anchorman (41 times), an industry or utility spokesperson (28 times), a scientist (14 times), a government agency official (14 times), and an elected government official (13 times).

For 76 nuclear power stories where a pronuclear side was presented, 131 persons presented the pro arguments for an average of 1.7 pro spokespersons per story. Analogously, for the 26 coal stories where a procoal side was presented, 41 persons presented the procoal arguments for an average of 1.6 pro spokespersons per story. Finally, for the 16 solar stories where a pro-solar side was presented, 31 persons presented the prosolar arguments for an

Table 3

A Comparison of the News Slant Given
to Television News Stories Regarding
Three Energy Technologies

News Slant Categories	Energy Technology			p ^a
	Nuclear Power	Coal	Solar	
Both sides of issue presented?				
Not applicable	148 (55.6%)	92 (72.4%)	9 (34.6%)	
Yes	71 (26.7%)	18 (14.2%)	9 (34.6%)	
Protechnology side only	5 (1.9%)	8 (6.3%)	7 (26.9%)	
Antitechnology side only	42 (15.8%)	9 (7.1%)	1 (3.8%)	.001 ^b
Overall, news story seems to...				
Strongly promote technology	13 (4.9%)	9 (7.1%)	12 (46.2%)	
Slightly promote technology	27 (10.2%)	11 (8.7%)	10 (38.5%)	
Neutral toward technology	133 (50.0%)	85 (66.9%)	3 (11.5%)	
Slightly oppose technology	71 (26.7%)	16 (12.6%)	1 (3.8%)	
Strongly oppose technology	22 (8.3%)	6 (4.7%)	0 (0.0%)	.001 ^b
Average score ^d	3.23	3.00	1.73	.001 ^c
Overall, news story discussed...				
Only benefits	16 (6.0%)	8 (6.3%)	9 (34.6%)	
More benefits than costs	11 (4.1%)	5 (3.9%)	11 (42.3%)	
Benefits/costs equally	30 (11.3%)	12 (9.4%)	1 (3.8%)	
More costs than benefits	39 (14.7%)	12 (9.4%)	1 (3.8%)	
Only costs	68 (25.6%)	48 (37.8%)	1 (3.8%)	
Not applicable	102 (38.3%)	42 (33.1%)	3 (11.5%)	.001 ^b
Average score ^e	3.81	3.98	1.87	.001 ^c

^a See Table 2 for a discussion of the meaning of p.

^b χ^2 test of independence.

^c Analysis of variance (F) test of significance.

^d Average score computed by assigning values 1 through 5 to categories "strongly promote technology" through "strongly oppose technology."

^e Average score computed by assigning values 1 through 5 to categories "only benefits" through "only costs." "Not applicable" ratings are not included in the average.

Table 4

Number of Persons Presenting Protechnology and Antitechnology
Sides of the Issue during Network
Television News Stories

Spokesperson	Protechnology Side				Antitechnology Side			
	Nuclear Power	Coal	Solar	Total	Nuclear Power	Coal	Solar	Total
Anchorman	23 (18)	7 (17)	11 (35)	41 (20)	59 (29)	4 (9)	3 (23)	66 (25)
Field Reporter	45 (34)	17 (41)	9 (29)	71 (35)	70 (34)	23 (51)	7 (54)	100 (38)
Studio Reporter	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	1 (0)
Science Editor	4 (3)	0 (0)	3 (10)	7 (3)	6 (3)	0 (0)	2 (15)	8 (3)
Commentator	3 (2)	0 (0)	0 (0)	3 (1)	3 (1)	0 (0)	0 (0)	3 (1)
Scientist	9 (7)	0 (0)	5 (16)	14 (7)	12 (6)	0 (0)	1 (8)	13 (5)
Elected Government Official	7 (5)	5 (12)	1 (3)	13 (6)	9 (4)	5 (11)	0 (0)	14 (5)
Government Agency Official	12 (9)	2 (5)	0 (0)	14 (7)	13 (6)	2 (4)	0 (0)	15 (6)
Industry or Utility Spokesperson	20 (15)	7 (17)	1 (3)	28 (14)	5 (3)	2 (4)	0 (0)	7 (3)
National Organiza- tion Spokesperson	3 (2)	2 (5)	0 (0)	5 (2)	9 (4)	0 (0)	0 (0)	9 (3)
Local Organization Spokesperson	1 (1)	0 (0)	0 (0)	1 (1)	9 (4)	3 (7)	0 (0)	12 (5)
Unaffiliated	4 (3)	1 (2)	1 (1)	6 (3)	7 (3)	6 (13)	0 (0)	13 (5)
TOTAL NUMBER OF SPOKESPERSONS	131	41	31	203	203	45	13	261
TOTAL APPLICABLE STORIES	76	26	16	118	113	27	10	150
NOT APPLICABLE	148	92	9	249	148	92	9	249
OTHER SIDE PRESENTED ONLY	42	9	1	52	5	8	7	20

NOTE: Numbers in parentheses are percentages based upon the total number of spokespersons for that column.

average of 1.9 pro spokespersons per story. Thus, on the average per story, more persons spoke in favor of solar than nuclear power or coal.

The persons presenting the pro arguments differed according to technology. For instance, relatively speaking, compared to nuclear power and coal, a disproportionate amount of the prosolar arguments were presented by the anchorman, the field reporter, the science editor, or a scientist. Conversely, a disproportionate amount of the pronuclear arguments were presented by industry or utility spokespersons. The effect that this might have is to lend more credibility to prosolar arguments compared to pronuclear arguments, because industry or utility spokespersons would likely not be trusted as much as news reporters and scientists (Melber et al., 1977; Nealey and Rankin, 1978).

The major presenters of the antitechnology side of the issue (see Table 4) were the field reporter (100 times), the anchorman (66 times), national or local organization spokespersons (21 times), a government agency official (15 times), an elected government official (14 times), a scientist (13 times), and unaffiliated citizens (13 times).

For the 113 nuclear power stories where an antinuclear side was presented, 203 persons presented the anti arguments for an average of 1.8 antinuclear spokespersons per story. For the 27 coal stories where an anticoal side was presented, 45 persons presented the anticoal arguments for an average of 1.8 anticoal spokespersons per story. Finally, for the 10 solar stories where an antisolar side was presented, 13 persons presented the antisolar arguments for an average of 1.3 antisolar spokespersons per story. On the average, then, more persons per news story were used to present antinuclear and anticoal arguments than were used the present antisolar arguments.

The persons presenting the antitechnology arguments differed according to technology. Anchormen frequently presented antinuclear material but rarely did so for coal. As expected, given the political salience of solar power, no elected government officials or government agency officials presented antisolar arguments. In terms of average number of persons presenting pro or con arguments, there was no appreciable difference between nuclear and coal. However, more persons presented the prosolar arguments (average of 1.9) than presented the antisolar arguments (average of 1.3).

A summary comparison of pro versus antinuclear spokespersons shows that anchormen presented 29 percent of the antinuclear arguments but only 18 percent of the pronuclear arguments. Field reporters present 34 percent of the arguments on each side. Government officials, both elected and agency spokespersons, were also evenly represented in pro- and antinuclear positions. National and local organization spokespersons were 3:1 antinuclear, while industry or utility spokespersons were primarily pronuclear.

Promote/oppose rating. Given the preceding findings, it appears that solar has been presented in a more positive fashion than nuclear power and coal, which seemed to receive somewhat the same treatment. The following measure allows a more direct determination on this question. Taking the whole news story into account, the story was rated as to whether it seemed to (a) strongly support the technology, (b) slightly promote the technology, (c) remain neutral toward the technology, (d) slightly oppose the technology, or (e) strongly oppose the technology. These ratings were scored from 1 (strongly promote) through 5 (strongly oppose) which allowed significance testing using an analysis of variance procedure. The results are shown in Table 3.

The Technology X Network interaction was not significant [$F(4,410)=0.36$, $p>.05$], nor was the main effect of network [$F(2,410)=0.52$, $p>.05$]. In other words, the three networks did not differ significantly in their support or opposition to energy technology in general, nor did any network appear to selectively favor or oppose a given technology more than did the other networks. However, the main effect of technology was highly significant [$F(2,410)=33.31$, $p<.001$]. Solar stories (average rating of 1.73) were presented in a significantly more positive fashion [$t(410)=6.62$, $p<.001$] than were coal stories (average rating of 3.00). Note that the coal story average rating was exactly neutral (3.00 on the five-point scale) and that this neutrality (see Table 3) was due to the fact that a majority of coal stories were rated neutral, while the remainder of the coal stories split somewhat evenly around the neutral point.

The average nuclear story rating (3.23) was slightly on the oppose side of the rating scale and differed significantly from both the solar average [$t(410)=8.19$, $p<.001$] and the coal average [$t(410)=2.39$, $p<.01$] although, substantively, the difference between coal and nuclear was not large. The nuclear average was also composed of numerous neutral ratings (50.0 percent), while oppose ratings (35.0 percent) outnumbered promote ratings (15.1 percent) (see Table 3). Thus, nuclear power and coal were both presented somewhat neutrally, although nuclear power was presented in a slightly more polarized and negative manner. Solar, however, was presented overall in a very positive fashion, with 84.6 percent of solar stories promoting it.

An important area to evaluate is whether the relative number of stories that promote, oppose, or are neutral about the three technologies changed over the six-year period of the study (see Figure 2). From 1972

Figure 2

Number of Stories which Promote, Oppose, or are Neutral about Nuclear Power, Coal, and Solar as a Function of Year

through 1974, the number of stories promoting nuclear power remained somewhat stable, but from 1975 through 1977 the number rose from 5 to 19. The number of promote coal stories peaked in 1973 and again in 1977, and the number of promote solar stories peaked in 1975 and 1977. Thus, while stories that promote nuclear power and solar increased in number from about 1975 on, the number of promote coal stories fluctuated and did not exhibit a consistent pattern of change over time.

The number of neutral nuclear power and coal stories increased steadily from 1972 through 1977. Only three neutral solar stories were ever aired, and all occurred in 1975. The rate of increase for neutral nuclear stories was much faster than the rate of increase for promote nuclear stories.

The number of oppose nuclear power stories increased at much the same rate as neutral nuclear stories from 1972 through 1976, but fell off somewhat in 1977. The number of oppose coal stories remained quite stable. Only one oppose solar story was aired and that occurred in 1975.

Thus, neutral and oppose nuclear power stories increased at the fastest rate from 1972 through 1977, followed by neutral coal stories, followed by promote nuclear power and solar stories. The number of promote and oppose coal stories and the number of neutral and oppose solar stories remained somewhat steady over the whole period of analysis.

The overall tendency was for nuclear newscasts to become more anti-nuclear from 1972 through 1976, but in 1977 the presentation of nuclear stories was quite evenly balanced. We have no way of knowing whether this change in 1977 reflected a change in policy by the television networks or not. Perhaps after the defeat of the nuclear power referendums in 1976, the news broadcasters began to take a less critical view of nuclear power as an energy option.

Regarding coal, the overall tendency was for promote and oppose stories to remain stable. However, the number of balanced presentations about coal increased quite steadily. This may indicate a desire on the part of the networks to educate the public about coal.

Benefit/cost rating. A related measure was the rating of the ratio of the benefit/cost discussion during the news story. Previous research on newspapers and magazines (Rankin et al., 1978) found that the benefit/cost and the promote/oppose ratings were quite similar, but that the promote/oppose ratings were a little more neutral. Such was the case for the data analyzed here, also (see Table 3).

Only 11.3 percent of the nuclear power stories and 9.4 percent of the coal stories had an equal discussion of benefits and costs. However, a large portion of the nuclear power (38.3 percent) and coal (33.1 percent) stories were rated as "not applicable," i.e., no benefit/cost discussion took place. It is likely that these "not applicable" stories are rated neutral on the promote/oppose measure.

On the remaining nuclear power and coal stories, costs were discussed much more than benefits. Here, 25.6 percent of the nuclear power stories and 37.8 percent of the coal stories discussed "only costs" while only 6.0 percent of the nuclear and 6.3 percent of the coal stories discussed "only benefits." Viewed in a different manner, of the stories that did discuss benefits and costs, 41.5 percent of the nuclear stories and 56.5 percent of the coal stories discussed only costs, and 23.8 percent of the nuclear and 14.1 percent of the coal stories discussed "more costs than benefits."

The findings were dramatically different for solar news stories. For solar stories, 34.6 percent discussed only benefits, 42.3 percent discussed more benefits than costs, and only 11.5 percent of the stories did not include some kind of benefit/cost discussion.

Leaving out the not applicable ratings, the "only benefits" through "only costs" ratings were given scale values of 1 through 5, respectively. The average score for the nuclear power (3.81) and coal (3.98) stories indicated that, on the average, these stories discussed more costs than benefits. The average solar rating (1.87) indicated that, on the average, the solar stories discussed more benefits than costs. Significance testing found that these averages differed significantly [$F(2,264)=23.05, p<.001$] and that this significance was due to the difference in the handling of solar stories compared to nuclear power [$t(264)=6.60, p<.001$] and coal [$t(264)=6.80, p<.001$]. The handling of the benefit/cost discussion did not differ significantly between nuclear and coal [$t(264)=0.96, p>.05$].

Summary. In general, the television networks were strongly positive about solar power. When applicable, the pro side of the solar story was almost always presented, and the costs of solar power were rarely presented. Such was not the case for nuclear power and coal stories, however.

When there was an opportunity to present both sides of a nuclear issue, such was done only about 60 percent of the time. Of the remaining stories, however, the antinuclear side of the issue was presented eight to one over the pronuclear side. Furthermore, when there was an opportunity for a discussion of benefits and costs of nuclear power, the cost discussion outweighed the benefit discussion about four to one. Coal was presented in a more neutral fashion than was nuclear power or solar. However, the cost discussion about coal, as for nuclear power, outweighed the benefit discussion about four to one.

The likely impact of these television news stories, then, would be for an individual, who was previously "neutral" about the three technologies, to strongly support solar development, to remain neutral about coal, and to oppose nuclear power.

News Content

Several different ratings were made in order to determine the content of the news stories. These ratings included the major and minor areas of the fuel cycles of the three technologies, the major and minor issues that were discussed, and extra information specifically about nuclear power demonstrations, coal mining, and nuclear waste disposal.

Areas. The areas of the fuel cycle, of course, differed across the three technologies. Also, the term "fuel cycle" is used loosely here, because the concept had to be expanded to include such areas as "regulations and licensing" and "transportation," for example. Thus, nuclear power, coal, and solar will be discussed separately in that order followed by a cross-technology comparison.

Regarding nuclear power, the area most discussed (see Table 5) was reactor operation. Here, 99 (37.2 percent) of the nuclear power news stories discussed reactor operation as the major area of interest and an additional 69 (25.9 percent) of the stories discussed reactor operation as a minor area. Thus, almost two-thirds of the stories (63.1 percent) included some discussion about reactor operation. Additionally, 27 (10.2 percent) of the stories were mainly about breeder reactors and 18 (6.8 percent) discussed breeder reactors as a minor area. Thus, nuclear power reactors have been the main area of television news coverage.

Other important nuclear power areas dealt with were regulations, licensing, and other controls (26.3 percent of the stories discussed this as a major or minor area), international sharing of nuclear technology (16.2 percent), and nuclear waste management (12.0) percent. The remainder of the areas were mentioned in less than 10 percent of the nuclear news stories.

Table 5

Major and Minor Areas Discussed in Television
Coverage of Nuclear Power

Area	Major Area	Minor Area	Total Mention
Uranium Supply		15 (5.6%)	15 (5.6%)
Mining and Milling		1 (0.4%)	1 (0.4%)
Enrichment and Fabrication	13 (4.9%)	9 (3.4%)	22 (8.3%)
Reactor Operation	99 (37.2%)	69 (25.9%)	168 (63.2%)
Fuel Reprocessing	5 (1.9%)	15 (5.6%)	20 (7.5%)
Breeder Reactor	27 (10.2%)	18 (6.8%)	45 (17.0%)
Waste Management	17 (6.4%)	15 (5.6%)	32 (12.0%)
Transportation	5 (1.9%)	3 (1.1%)	8 (3.0%)
International Sharing of Nuclear Technology	33 (12.4%)	10 (3.8%)	43 (16.2%)
Propositions and Initiatives	9 (3.4%)	7 (2.6%)	16 (6.0%)
Regulations, Licensing, and Other Controls	29 (10.9%)	41 (15.4%)	70 (26.3%)
Nominations or Information about Government Nuclear Agencies	7 (2.6%)	1 (0.4%)	8 (3.0%)
General	22 (8.3%)		22 (8.3%)
TOTAL	266	204	470

Coal stories were much different in content area. The major area regarding coal was coal strikes (see Table 6). Here, 209 out of a total of 463 coal stories were mainly about coal strikes. Coal strike stories were not content analyzed. Remember also that only half (127) of the non-strike coal stories were analyzed. Additionally, 13 (10.2 percent) of the content analyzed non-strike stories were mainly about labor force concerns and an additional 15 (11.8 percent) discussed labor force concerns as a minor area. Thus, approximately two-thirds of the television news stories about coal dealt with some aspect of labor force issues.

Of the remaining content analyzed coal stories, two areas were of most importance. Mining was the biggest non-strike area, 29 (22.8 percent) of the news stories dealt with mining as the major area and an additional 69 (54.3 percent) articles dealt with mining as a minor area for a total of 77.1 percent of the non-strike stories dealing with mining. Of the articles that discussed mining, 49.0 percent were about strip mining, 32.4 percent were about underground mining, 2.0 percent specifically mentioned both, and the remaining 16.7 percent did not specify the type of mining.

By far, the biggest area discussed for solar was solar heating--13 (50.0 percent) of the stories were mainly about solar heating and an additional 5 (19.2 percent) discussed solar heating as a minor area (see Table 7). The discussion of small scale solar units, in general, was a minor area discussed in 9 (34.6 percent) of the stories. Large solar power plants were a major area in 2 (7.7 percent) of the stories and a minor area in 4 (15.4 percent) of the stories. Solar research was mentioned in 15.3 percent of the solar stories.

Thus, the major areas of discussion differed for the three technologies. For coal, the major areas discussed dealt with the "front end" of the coal fuel

Table 6

Major and Minor Areas Discussed in
Television News Coverage of Coal

Area	Major Area	Minor Area	Total Mention
Mining	29 (22.8%)	69 (54.3%)	98 (77.1%)
Coal Gasification		2 (1.6%)	2 (1.6%)
Coal Plant Operation	8 (6.3%)	15 (11.0%)	22 (17.3%)
Coal Wastes	4 (3.1%)		4 (3.1%)
Transportation	1 (0.8%)	1 (0.8%)	2 (1.6%)
Labor Force Concerns	13 (10.2%)	15 (11.8%)	28 (22.0%)
Regulations, Laws, and other Controls	57 (44.9%)	10 (7.9%)	67 (52.8%)
General	15 (11.8%)		15 (11.8%)
TOTAL ^a	127	111	238
Strikes ^b	209		

^a Only half of the coal stories were content analyzed; therefore, the actual number of stories discussing these coal areas would be about double, but the percentages would remain the same.

^b News stories specifically about coal strikes were not content analyzed, but were included here for comparison purposes.

Table 7

Major and Minor Areas Discussed in
Television News Coverage of Solar

Area	Major Area	Minor Area	Total Mention
Research on Solar	1 (3.8%)	3 (11.5%)	4 (15.3%)
Large Power Plant Operation	2 (7.7%)	4 (15.4%)	6 (23.1%)
Small Scale Unit		9 (34.6%)	9 (34.6%)
Photo Voltaic Cells		2 (7.7%)	2 (7.7%)
Wind Power	1 (3.8%)	1 (3.8%)	2 (7.6%)
Solar Heating	13 (50.0%)	5 (19.2%)	18 (69.2%)
Regulations, Laws, and Other Controls	1 (3.3%)	1 (3.8%)	2 (7.6%)
Other	8 (30.3%)		8 (30.8%)
TOTAL	26	25	51

cycle, namely coal mining and coal miner strikes. For nuclear power, however, power plant operation was the main area discussed. Discussions on laws, regulations, and licensing were major areas of discussion for both coal and nuclear power. Solar stories dealt primarily with solar heating and secondarily with solar methods of producing electricity.

Issues. Not only do news stories discuss different areas of the nuclear power, coal, or solar fuel cycles, they also discuss the important issues connected with these areas. Again, the issues are not the same across technologies, but certain comparisons can be made. Nuclear power will be discussed first followed by coal and solar.

On the average, 2.4 issues were mentioned per nuclear story. The most-discussed nuclear issue related to political decisions being made (or to political decisions that needed to be made) about different areas of the nuclear fuel cycle (see Table 8). Almost half of the stories (45.5 percent) dealt with this issue area. An area that received as much attention was health and safety issues. Although health and safety are listed separately in Table 8, our reliability checks found that it was hard to distinguish between these two issues. Therefore, they will be combined in this discussion. Fifty-three (20.0 percent) of the stories were mainly about health and safety issues, and an additional 70 (26.3 percent) stories discussed health and safety as a minor issue. Thus, 46.3 percent of the nuclear television stories discussed health and safety issues related to nuclear power.

The next most-discussed issue was economics. While 67 (30.2 percent) of the stories discussed economic issues, only 12 (4.5 percent) discussed economics as the main issue. The remaining 55 (20.7 percent) discussed economics as a minor issue. The issues that were discussed as a major or minor area (total

Table 8

Major and Minor Issues Discussed in
Television News Coverage of
Nuclear Power

Issue	Major Issue	Minor Issue	Total Mention
Safety	43 (16.2%)	50 (18.8%)	93 (35.0%)
Health	10 (3.8%)	20 (7.5%)	30 (11.3%)
Economics	12 (4.5%)	55 (20.7%)	67 (30.2%)
Political Decisions	85 (32.0%)	36 (13.5%)	121 (45.5%)
Unplanned Releases	2 (0.8%)	20 (7.5%)	22 (8.3%)
Need for Nuclear Power	15 (5.6%)	20 (7.5%)	35 (13.1%)
Proliferation	13 (4.9%)	23 (8.6%)	36 (13.5%)
Technical Problems/Solutions	15 (5.6%)	25 (9.4%)	40 (15.0%)
Facility Location	20 (7.5%)	26 (9.8%)	46 (17.3%)
Environmental Concerns	10 (3.8%)	29 (10.9%)	39 (14.7%)
Candor to Public	1 (0.4%)	10 (3.8%)	11 (4.2%)
Safeguards	22 (8.3%)	25 (9.4%)	47 (17.7%)
Public's Right to Decide	2 (0.8%)	4 (1.5%)	6 (2.3%)
Civil Liberties		1 (0.4%)	1 (0.4%)
Obligations to Future Generations	1 (0.4%)	1 (0.4%)	2 (0.8%)
Uranium Resources	1 (0.4%)	4 (1.5%)	5 (1.9%)
Alternatives to Nuclear Power		8 (3.0%)	8 (3.0%)
Conservation		3 (1.1%)	3 (1.1%)
Other	14 (5.2%)		14 (5.2%)
TOTAL	266	360	626

mention) in from 10 percent to 20 percent of the news stories included: safeguards (17.7 percent), facility location (17.3 percent), technical problems/solutions (15.0 percent), environmental concerns (14.7 percent), proliferation (13.5 percent), and the need for nuclear power (13.1 percent). The rest of the issues were mentioned less than 10 percent of the time. Many of the issues that receive a fair amount of attention among the "insider expert" participants in the nuclear debate (Hébert, Rankin, Brown, Schuller, Smith, Goodnight, and Lippek, 1978; Nealey and Radford, 1978)--candor to the public by the government, the public's right to participate in the nuclear decision-making process, concerns over maintenance of civil liberties, and obligations to future generations--have received little attention in the television news casts.

The pattern of discussion of coal issues was somewhat the same with a notable exception regarding environmental concerns (see Table 9). As with nuclear power, political decisions regarding coal were numerous--a plurality of all stories had political decisions as the major issue (28.3 percent) and a majority of all stories (53.5 percent) at least mentioned political decisions as an issue. Also, health and safety issues were prominent--38.6 percent of all stories were concerned to some extent with this issue area.

The major difference in issue discussion between nuclear power and coal related to environmental issues. While only 14.7 percent of the nuclear power stories dealt with environmental concerns, pollution and land reclamation from strip-mining each were discussed in 34.6 percent of the coal stories. Each were minor issues over twice as often as major issues. Regardless, environmental concerns over coal are much more salient to television news than environmental concerns over nuclear.

Table 9

Major and Minor Issues Discussed in
Television News Coverage of Coal^a

Issue	Major Issue	Minor Issue	Total Mention
Safety	32 (25.2%)	4 (3.1%)	36 (28.3%)
Health	2 (1.6%)	11 (8.7%)	13 (10.3%)
Economics	6 (4.7%)	24 (18.9%)	30 (23.6%)
Political Decisions	36 (28.3%)	32 (25.2%)	68 (53.7%)
Technological Problems/Solutions	1 (0.8%)	4 (3.1%)	5 (3.9%)
Location of Facilities	1 (0.8%)	5 (3.9%)	6 (4.7%)
Pollution	13 (10.2%)	31 (24.4%)	44 (34.6%)
Land Reclamation	13 (10.2%)	31 (24.4%)	44 (34.6%)
Coal Availability	5 (3.9%)	6 (4.7%)	11 (8.6%)
Coal as an Alternative to other Power Sources	15 (11.8%)	12 (9.4%)	27 (21.2%)
Energy Alternative to Coal	1 (0.8%)	1 (0.8%)	2 (1.6%)
Other	2 (1.6%)	1 (0.8%)	3 (2.4%)
TOTAL	127	162	289

^a Strike stories (209 total) are not included.

Economic issues received less total mention regarding coal (23.6 percent) than nuclear power (30.2 percent). However, since economics is an important strike issue (miner wages and fringe benefits), economic issues are likely more numerous in the full population of coal stories.

The last important coal issue was the use of coal as an energy alternative to petroleum fuels and, possibly, nuclear power (this distinction was not made by our content analysis). This was the main issue in 11.8 percent of the non-strike stories. Only health and safety issues and issues regarding political decisions were major issue areas more often than the issue of using coal as an alternative energy source. An average of 2.3 issues were discussed per coal story, about the same as for nuclear power.

This pattern of issue discussion, including the information about strikes, seems to portray the following picture. The television news public is being told that coal is a necessary fuel in the U.S. energy outlook. The other side of the story is perhaps best summed up by a quote from the Tennessee Valley Authority chairperson, David Freeman, "There are two things wrong with coal today. We can't mine it and we can't burn it." (Sjoholm-Sierchio and Krass, 1978). Television coverage of coal is in line with this characterization.

The pattern of issue discussion for solar is totally different from that for nuclear power and coal (see Table 10). Health and safety concerns are not issues for solar. In terms of the major story issue, the discussion of solar as an alternative power source was most important--13 (50.0 percent) of the stories discussed this as the major issue and an additional 3 (11.5 percent) stories mentioned it as minor issue. In terms of total mention, however, the economics of solar power was most discussed. Seventeen (65.4 percent) of the stories discussed solar economics, but only in 4 (15.4 percent) was economics the main issue.

Table 10
Major and Minor Issues Discussed in
Television News Coverage of Solar

Issue	Major Issue	Minor Issue	Total Mention
Solar as an Alternative Power Source	13 (50.0%)	3 (11.5%)	16 (61.5%)
Technical Problems/Solutions	1 (3.8%)	3 (11.5%)	4 (15.3%)
Economics	4 (15.4%)	13 (50.0%)	17 (65.4%)
Political Decisions	5 (19.2%)	2 (7.7%)	7 (26.9%)
Availability	1 (3.8%)	9 (34.6%)	10 (38.4%)
Other	2 (7.7%)		2 (7.7%)
TOTAL	26	30	56

Another important issue area was availability. Although availability discussions of nuclear power and coal deal with the availability of fuel, solar availability has two aspects. The more important question is, basically, when will the technology be far enough along to provide a significant portion of our energy needs. A lesser issue is what happens with solar power when the sun sets. While 10 (38.4 percent) of the stories dealt with availability, most of the time (34.6 percent) it was a minor issue. To a lesser degree than was the case for nuclear power and coal, political decisions also comprised an important issue area--7 (26.9 percent) stories dealt with the issue. The average number of solar issues discussed per story was 2.2.

In summary, the major issues surrounding nuclear power and coal are somewhat similar, but quite different from solar issues. Nuclear power and coal stories often dealt with political issues, health and safety issues, and, to a slightly lesser degree, economic issues. However, unlike nuclear power stories, a large number of coal stories also dealt with environmental issues, namely pollution and land reclamation. While the issue of energy supply is addressed in nuclear power stories as a need for nuclear power, the concept for coal is addressed in connection with coal as an alternative energy source. This supply issue was addressed more often in coal stories than in nuclear power stories.

The concept of solar as an alternative energy source was the major theme in half the solar stories. Economics was also an important issue area, more so for solar than for nuclear power and coal. Economics was usually a minor issue in the solar stories--the economic point often made was that solar electricity, especially from certain sources, was still quite expensive. There was little difference across technologies in the average number of issues discussed per story.

Nuclear wastes. Given the present importance of nuclear waste management as a public issue area in the nuclear debate (Rankin and Nealey, 1978), stories that were about nuclear waste management were further analyzed regarding whether the story was about storage or disposal, military wastes or commercial wastes, and high-level wastes or low-level wastes (see Table 11). Also, the issues discussed specifically about nuclear waste management were separately content analyzed and will be reported here.

The most important point to be drawn from this analysis is that the networks often did not specify the type of nuclear wastes being discussed--53.1 percent of the stories were not specific about whether storage or disposal was being discussed, 71.9 percent were not specific about whether military or commercial wastes were being discussed, and 87.5 percent were not specific about whether high-level or low-level wastes were being discussed. Although it would have been possible for someone familiar with nuclear power to have made these distinctions, average members of the general public, who are largely uninformed about nuclear waste management (Nealey and Rankin, 1978), would likely not have been able to do so. If distinctions were made in the news story, the story most likely concerned itself with storage and disposal of commercial wastes.

The issues discussed regarding nuclear wastes differed somewhat from those discussed regarding the remainder of the fuel cycle (see Table 12). Issues surrounding waste disposal technical problems were the major issue in 15 (46.9 percent) of the nuclear waste stories and were mentioned in a total of 20 (62.5 percent) of all nuclear waste stories. Health and safety issues also were discussed much more often (34.4 percent) in relation to nuclear wastes.

Table 11

Characteristics of Nuclear Wastes Discussed
in Television News Stories

Characteristics		
Type of Waste Management		
Temporary Storage	4	(12.5%)
Permanent Disposal	3	(9.4%)
Storage and Disposal	8	(25.0%)
Not Specific	17	(53.1%)
Military vs. Commercial Waste		
Military	0	(0.0%)
Commercial	7	(21.9%)
Military and Commercial	2	(6.3%)
Not Specific	23	(71.9%)
Type of Waste		
High Level	0	(0.0%)
Low Level	2	(6.3%)
High and Low Level	2	(6.3%)
Not Specific	28	(87.5%)

Table 12
Issues Discussed Specific To
Nuclear Waste Management

Issue	Major Issue	Minor Issue	Total Mention
Technical Problems	15 (46.9%)	5 (15.6%)	20 (62.5%)
Safety	10 (31.3%)	6 (18.8%)	16 (50.1%)
Health	1 (3.1%)	5 (15.6%)	6 (18.7%)
Environmental Issues		5 (15.6%)	5 (15.6%)
Obligations to Future Generations		2 (6.3%)	2 (6.3%)
Political Decisions	2 (6.3%)	7 (21.9%)	9 (28.2%)
Facility Location		4 (12.5%)	4 (12.5%)
Salt Bed Disposal		5 (15.6%)	5 (15.6%)
Alternatives to Salt Bed Disposal		2 (6.3%)	2 (6.3%)
Unplanned Releases	2 (6.3%)	6 (18.8%)	8 (25.1%)
Safeguards	1 (3.1%)		1 (3.1%)
Economics		3 (9.4%)	3 (9.4%)
Candor to Public		2 (6.3%)	2 (6.3%)
Public's Right to Decide	1 (3.1%)	2 (6.3%)	3 (9.4%)
TOTAL	32	54	86

Waste management political decisions also received a fair amount of attention (28.2 percent total mention), as did unplanned releases (25.1 percent total mention). Specific disposal concepts--salt bed disposal and alternatives--did not receive a large amount of media attention. Economic issues were little discussed in relationship to nuclear waste management issues. As for the other aspects of the nuclear fuel cycle, more esoteric issues--obligations to future generations, candor to the public, and the public's involvement in decision-making--were mentioned less than 10 percent of the time.

SUMMARY AND DISCUSSION

Nuclear power, coal and solar have received different treatment by network television news. In general, nuclear power and coal were presented in somewhat the same manner, but solar was presented much differently.

In terms of prominence, coal stories were most prominent and solar stories were least prominent. Nuclear power stories were given only slightly less prominence than coal stories. When coal strike stories are counted, coal stories outnumbered nuclear power stories 463 to 266 from 1972 through 1977. Otherwise, non-strike coal stories totalled 254. Only 26 news stories mentioned solar power. Nuclear power stories increased steadily in number over the period of analysis. Non-strike coal stories increased at a slower rate, so that more nuclear power stories have been broadcast since 1976 than non-strike coal stories. The number of coal strike stories has fluctuated. Very few solar stories were broadcast until 1975.

Non-strike coal stories began significantly earlier into the news broadcast than did nuclear power stories and solar stories. Non-strike coal stories were also more often kept in network film files as background material that could be used when news time allowed, and they were more often continuations of previous news stories than were nuclear power and solar stories. Thus, in general, coal stories were given slightly more prominence than nuclear power stories which were given significantly more prominence than solar stories.

A set of ratings was used to determine whether nuclear power, coal, and solar stories were handled in the same fashion. The television news was strongly positive about solar power. When appropriate, the pro side of the solar story was almost always presented, the stories generally

promoted solar, and costs or risks associated with solar power were rarely presented. Perhaps this is the way that nuclear power was presented in the late 1950s and early 1960s during the Atoms for Peace program. The disadvantages or risks of nuclear power were not as well articulated then as now (Melber et al., 1977; Rankin and Nealey, 1978). Perhaps new energy technologies have a "grace" period during which the benefits are much more obvious than the costs.

However, the "grace" period seems to be over for nuclear power and coal. Overall, nuclear power stories were somewhat antinuclear, although numerous neutral stories were presented. Coal stories were presented in a generally neutral fashion. However, for both technologies, the cost discussion outnumbered the benefit discussion about four to one. Overall, the general feeling being portrayed seemed to be neutrality toward coal and moderate opposition to nuclear power.

The news content differed among the three technologies, although nuclear power and coal were somewhat alike at least in terms of news issues. Nuclear power stories most often dealt with reactor operation. Other, less important areas included regulations, licensing, or other controls, international sharing of nuclear technology, and nuclear waste management. Stories about nuclear waste management usually did not distinguish between storage and disposal, between commercial wastes and military wastes, or between high-level wastes and low-level wastes.

Coal strikes comprised an important area of news coverage although strike stories were not analyzed for issue content. Coal mining was the other important coal area. Solar stories were most often about solar heating and other small-scale solar units.

Specific issues were also analyzed. The most important nuclear power issues were (in order of importance) political decisions, health and

safety concerns, and economic issues. Coal stories were much the same except that environmental issues were most prominent followed by political decisions, health and safety concerns, and economic issues. The most important solar issue was the use of solar power as an alternative energy source followed by solar economic issues.

These findings are fairly consistent with those reported by Rankin et al. (1978) and Nealey et al. (1978) regarding print media coverage of nuclear power and coal. One major difference, however, is in relation to the number of nuclear power and coal stories. In the study of print media, nuclear power stories outnumbered coal stories about two to one when coal strike stories were included. However, television news covered coal about twice as much as nuclear power when coal strike stories were counted.

The television networks tended to provide more nuclear power and coal stories that were neutral than did newspapers and magazines. However, television and newspapers discussed benefits and costs in about the same manner, although magazines provided more discussion of coal benefits than did newspapers or television.

The major issues of concern in the nuclear power and coal news stories were quite similar between television and the print media. Both media were mostly concerned with reactor operation for nuclear power and strikes and mining for coal. Also, the issues of interest across the two media were much the same: political issues, health and safety issues, and economic issues for nuclear power and political issues, strike issues, and health and safety issues for coal. The major difference was that environmental concerns regarding coal (strip mining and pollution) were much more prominent in the television news stories than in print media stories.

In summary, these findings indicate that the news media, both television and the print media, handle energy technologies in a reasonably fair fashion.

Although nuclear power was handled in a little more controversial fashion than coal and with a little more "anti" slant than coal, this isn't surprising given the societal controversy over nuclear power. Although a controversy also exists regarding coal use, it is not as heated as the nuclear debate, and the media simply seem to be reflecting that fact. However, solar, although coverage is infrequent, is being handled in a very positive manner by television news.

Why then, do some members of the nuclear industry feel that nuclear power is being given unfair treatment by the media? For one thing, the media did not distinguish between concepts that the industry may feel should be differentiated--e.g., distinguishing between commercial wastes and military wastes. Also, we noticed in viewing the news broadcasts that the same film footage of a reactor, for example, would show up quite frequently. However, at one time the reactor was said to be located in Michigan, say, while another time the (same) reactor was said to be located in California. Nuclear insiders likely pick up on these discrepancies which would cause them to discredit the news source. A final possibility has to do with errors in reporting. Although "errors" were not analyzed during our study, it is quite likely that errors in reporting did occur. For instance, Scanlon, Luukko, and Morton (1978) analyzed print media coverage of six crisis events in Canada and concluded that the general impression given by the newspapers was correct, but that the newspapers often made errors on details because of haste in reporting. What likely happens, then, is that nuclear technicians pick up on these errors and discredit the source because the "truth" is not being presented.

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