

LOW-LEVEL WASTE--SOME RECOMMENDATIONS

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Recently I gave a paper at the Health Physics Society's 12th Midyear Symposium on Low-Level Waste Management. The title of the paper was "The Status of Low-Level Radioactive Waste Disposal--How to Plan a Disaster!" The only criticism that was received from some of those in attendance was that the word "disaster" should be toned down to a milder level. Put in a different manner, "Don't rock the boat!" I believe the boat is already rocking and unless we stabilize the boat we may all be taking a "bath". For those in attendance at this meeting, I wish to reiterate that unless we get our act in order, there may be a serious problem in keeping nuclear power as a viable energy source in this country. Whether one considers this a disaster or not is due to the perspective taken. The act signified actors: the actors are you and me, the regulatory bodies and everyone that recognizes this energy source as a viable one.

The purpose of this workshop is to discuss, Low-Level Waste Disposal Practices. An even more specific goal is to stimulate conversation regarding what can be done to develop acceptable disposal practices in all parts of the country. Such ideas as changes in the character and volume of waste, what methods of burial are best and implementation of alternate disposal techniques for some portions of the waste should be discussed.

First, let me put the problem in perspective. Table I lists the current nuclear reactor status given by the Atomic Industrial Forum (AIF) as of November 29, 1978. However, the February issue of Nuclear News (page 26) states that there are 209 nuclear units worldwide representing 109,463 MWe of capacity in commercial operation. It is projected that there will be 88 units and 149 units on line by the end of 1980 and 1985, respectively. Commonwealth Edison Company (CECO) recently placed an order for two 1,150 MWe nuclear units from Westinghouse. At the same time, Public Service Electric & Gas Company cancelled all four of its floating platform nuclear plants. Projections had previously indicated that only two domestic nuclear reactors would be ordered during 1979; those two were the CECO plants

TABLE I
NUCLEAR REACTOR STATUS REPORT

| | | |
|----------|------------------------------------|-----------------------|
| 72 | Reactors with operating license | 52,273 MWe |
| 90 | Reactors with construction permits | 98,968 MWe |
| 37 | Reactors on order | 42,565 MWe |
| <u>0</u> | Letters of intent/options | <u>0</u> |
| 203 | | TOTAL-----197,918 MWe |

which have already been ordered. Therefore, the prospects for nuclear steam supply system vendors during 1979 appear to be bleak indeed.

Secondly, those that are familiar with this industry know that the low-level waste burial ground history has been quite confusing. Table II shows the history of low-level waste burial sites. In 1975, there were six operating burial sites. Currently, only three of these sites are operating; two west of the Continental Divide and one in the eastern part of the United States. The Barnwell site located in South Carolina, presently has a limitation of approximately 200,000 ft³/month on shipments into the burial site. There is always the possibility that the State of South Carolina will become more concerned about taking most of the waste east of the Mississippi. Also, the State of South Carolina is beginning to scrutinize what comes into the site. For example, recently, the State placed a hold on receiving oily waste shipments. The State is currently evaluating the various methods of solidifying oily waste and feels that until such criteria are set, the site can no longer receive this type of waste. The State of South Carolina is also beginning to look at organics similar to that in liquid scintillation vials. There is always the impending possibility of placing a hold on burial of urea-formaldehyde solidified low-level waste. Chem Nuclear Systems, Inc. (CNSI), recently suspended efforts to open a burial site in New Mexico due to licensing problems. Nuclear Engineering Company (NECO) has run into continual red tape in attempting to license additional space for Sheffield. It was reported in Nucleonics Week that one NECO official said, "...it's paralysis by analysis." In the February issue of Nucleonics Week it was reported that on December 27, 1978, NECO filed a motion to suspend proceedings on its application to renew the license of the Sheffield, Illinois, low-level waste burial ground. Illinois attorney general, William Scott, filed a suit in early December to seek complete shutdown of the Sheffield facility. There are two reasons--safety and financial--why Maxey Flats will probably remain closed. First, Kentucky will insist that state and federal studies, now under way, prove that it is 100 percent safe to bury low-level waste at the site before operations resume. Second, the state would have to charge taxes high enough to discourage private industry from operating the site in order to maintain a profit and ensure long-term care. However, there is some attempt to open a low-level waste burial site in Lyons, Kansas at the site of the old high-level waste salt mines. The opening of other low-level waste burial sites would be of benefit to the nuclear industry.

TABLE II
HISTORY OF LOW-LEVEL WASTE BURIAL SITES

| <u>Name</u> | <u>Location</u> | <u>Operating</u> | <u>Comments</u> |
|--------------|-----------------|------------------|--|
| West Valley | New York | No | Operations suspended in March, 1975 |
| Maxey Flats | Kentucky | No | Operations suspended in December, 1977 |
| Sheffield | Illinois | No | Operations suspended in April, 1978 |
| Barnwell | South Carolina | Yes | 135,000 ft ³ per month limitation imposed |
| Hanford | Washington | Yes | |
| Beatty | Nevada | Yes | |
| <hr/> | | | |
| Chem Nuclear | New Mexico | No | Licensing effort suspended |
| SWECo | Kansas | No | Licensing application in |

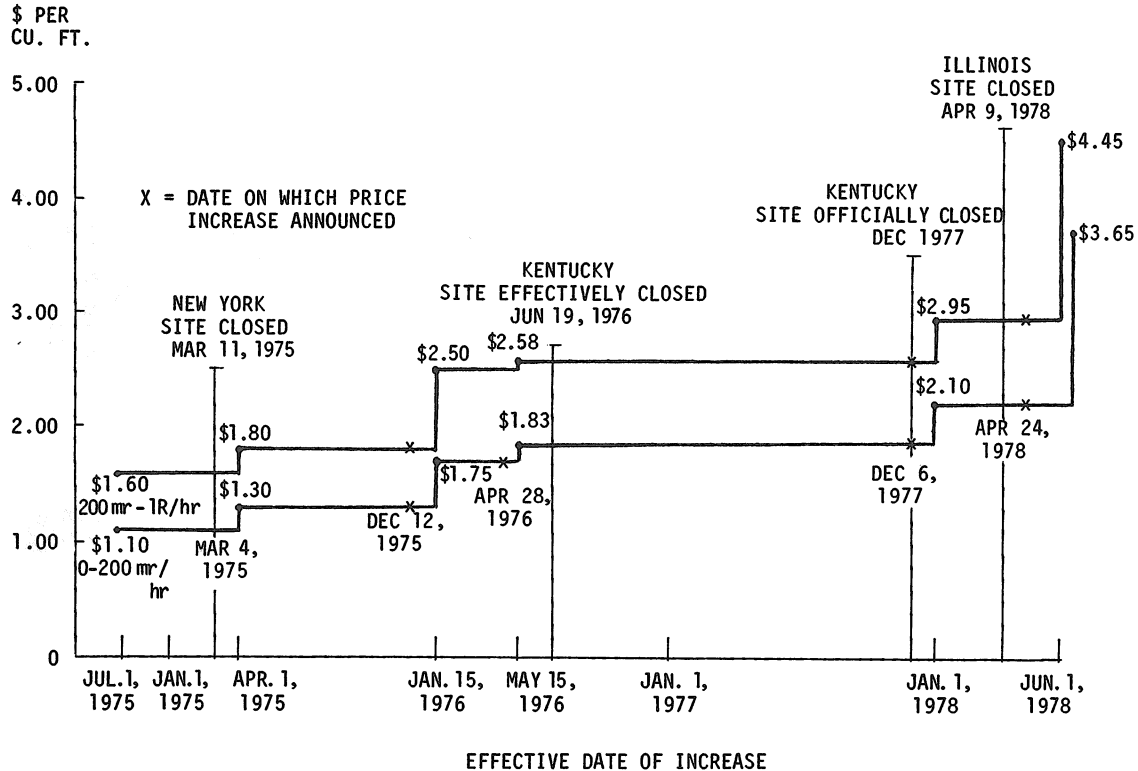
The third area in setting the stage for this part of the workshop is to identify some specific problems that now face the nuclear industry regarding low-level waste.

Figure 1 shows the increase in burial costs over a period of time. The top curve is the price increases for the western burial sites operated by NECO. The bottom curve is the price increases for the Barnwell site operated by CNSI. During 1978, burial costs at the Barnwell, South Carolina site increased approximately 85 percent for waste in the 0-200 mRr/hr range. This is a significant price increase. On December 28, 1978, users of the Barnwell site were notified of additional price increases, primarily for higher level waste, various handling and surcharges. At this point, the cost of burial is becoming an important factor in the budgets for operating nuclear power plants.

A second and perhaps even more significant problem, is that of transportation. The routes to get to the burial sites are being threatened and costs are increasing. Restrictive statutes and ordinances have been adopted in over 50 states and localities. For example, Clergy and Laity Concerned (CALC), a group of northwest nuclear opponents, hope to choke off transportation routes to Hanford. Their aim is the Hanford facility itself, but the impact will be to stop the receipt of radioactive waste at the low-level burial grounds.

Figure 2 shows the increase in the cost of transportation. As one can see, the increase from 1973 to 1978 has been approximately 30 percent. As a comparison, Table III gives a simple analysis of the impact of the cost of transportation of low-level radioactive waste for one particular nuclear plant located in the midwest. This analysis is for a shipping cask that contains approximately 170 ft.³ of waste. Before the Sheffield, Illinois facility was closed, the plant was paying about \$400 for transporting the waste to the burial site. When Sheffield closed the cost for transportation resulted in a four-fold increase for shipments to Barnwell. If the Barnwell facility were to close, the cost for transportation would be about an eight-fold increase. This analysis does not include the increased probability of an accident on the highways. This cost increase does not parallel the cost increase received from the burial grounds. It is my feeling

FIG. 1
BURIAL PRICE INCREASES



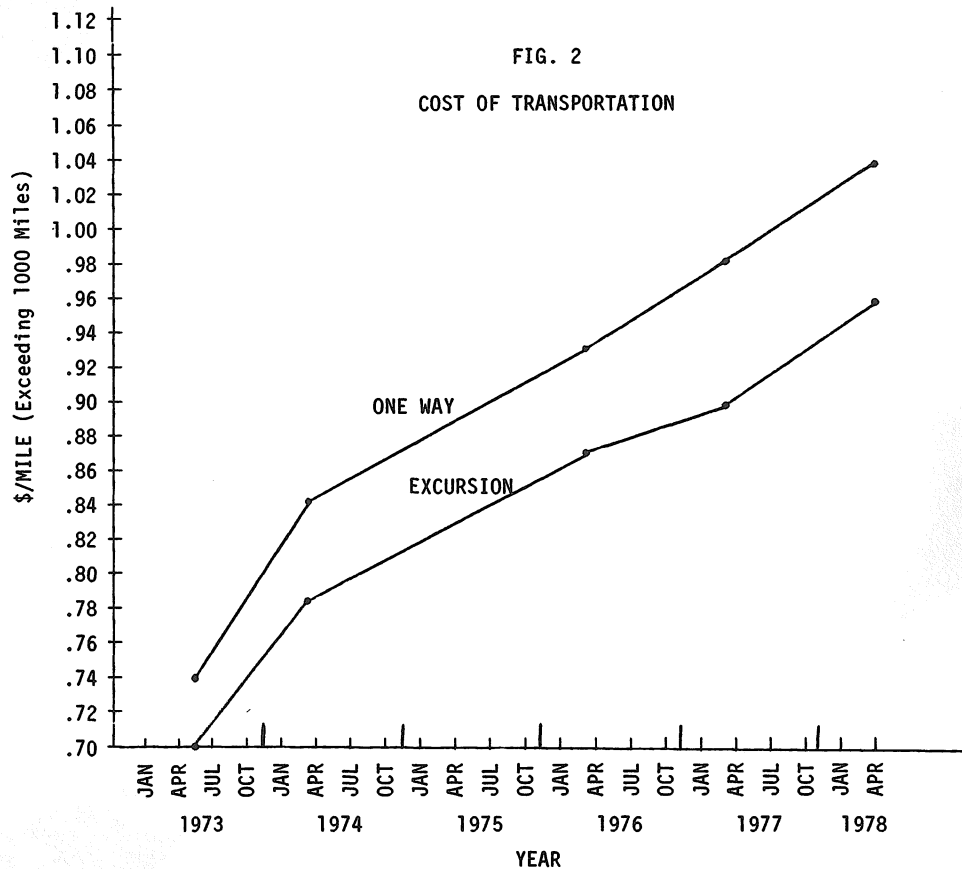


TABLE III
TRANSPORTATION COSTS FROM A MIDWEST PLANT

| | <u>Approximate Cost</u> |
|-----------------------------------|-----------------------------|
| Plant to Sheffield, Illinois | \$ 400 |
| Plant to Barnwell, South Carolina | 1,700 |
| Plant to Beatty, Nevada | 3,400 |

that the transportation problem could become the major problem facing the industry due to the fact that many states are considering the banning of routes for transporting any type of radioactive waste through their localities and states.

Due to significant efforts and changes in design, one radwaste hauling vendor has been able to control or practically maintain the costs for some of his shipping casks over a five-year period. This, of course, is not the case with most pieces of equipment. The escalation rate has been averaging approximately eight percent per year.

Table IV is a recent analysis of how different costs have risen since 1967 and since one year ago this January. The point is that transportation and equipment costs are falling within the ranges shown in Table IV. The recent burial price increases have indicated a potential "run-away" situation. With increases of approximately 85 percent for the 0-200 mR/hr range waste occurring during 1978, one must keep a cautious eye on the future if he is to budget this portion of operating costs adequately.

What must be done to effectively get the nuclear industry out of the dilemma that we now face? I believe that there are basically four major steps that must be taken. I will then list a number of questions that should be looked at and then open for discussion.

1. First of all, states must accept the fact that they are involved in the production of radioactive waste if nuclear plants are located in their states. Most states produce medical and institutional radioactive waste and all states produce some toxic chemical wastes. An official of the State of South Carolina recently related that the state was doing its share by accepting low-level radioactive waste and it was time that someone else handled the other types of waste, such as toxic chemical waste. I am suggesting that a serious look be taken by the states and that their involvement in production of radioactive and toxic chemical wastes be reviewed. It is recognized that

TABLE IV
HOW DIFFERENT COSTS HAVE RISEN

| | <u>Percent Since 1967</u> | <u>Percent Since Year Ago</u> |
|---------------------------|-----------------------------------|---------------------------------------|
| Overall Living Costs | 101 | 8.8 |
| Food, including meals out | 112 | 11.3 |
| Housing and operations | 110 | 9.8 |
| Transportation | 90 | 6.6 |
| Clothing and upkeep | 63 | 4.1 |
| Medical care | 125 | 8.5 |
| Personal care | 86 | 6.7 |
| Entertainment | 79 | 4.7 |

the federal government must take the lead before the states can act. The states must somehow become involved; either by providing a low-level waste burial ground, a medical/institutional radioactive waste burial ground, a toxic waste burial ground, or by entering into some cooperative venture. A great deal of cooperation would be required by the states, but it is a simple fact that all of the states make a contribution to the waste produced and they should share in the handling and burial of these wastes.

2. The second major step is that the regulatory agencies must not only recognize the peril of not solving the low-level waste problem, but that they must develop a schedule to seek answers to these problems before the problem becomes even more serious. For example, the DOE is considering a contingency plan to take low-level waste at its burial sites in emergency situations. However, to my knowledge no real plan has been placed in effect and if Barnwell were to close for some particular reason, the availability of casks to ship low-level waste to Beatty and Hanford would create a real problem for the nuclear industry.
3. The third major step is that the nuclear industry must go on the "warpath." There is enough evidence to show the economic advantages and safety of nuclear power that a more positive attitude must be taken. Is nuclear power really cheaper? The New England power plants have been producing power for 1.293 cents/kwh over the past two years compared with 2.662 cents for oil-fired capacity. Most people recognize that the nuclear power question is now a political rather than a technical or environmental one. We must direct our warpath towards the political arena and become as positive and outspoken as the anti-nuclear proponents.

4. The fourth major step is to improve the burial ground situation. There are basically two alternatives as far as I can see. First, we can continue with commercially-operated sites and, second we could proceed with government-controlled burial sites. At this time, I am not sure which is the best direction to take. It is obvious that there could be some advantage now to having government-controlled burial grounds because the ability to open government burial sites would be easier. However, there are disadvantages that must be considered. This question must be studied and a decision made prior to a decision being forced upon the industry.

We should consider the following concerns if we are to ease the burdens of waste management at the operating nuclear power plants in the United States.

1. Some vendors who wish to search out and operate commercial low-level waste burial sites are reluctant to do so because of the possibility of interim on-site radwaste storage in engineered facilities and permanent disposal in on-site shallow land burial facilities.
2. How do we classify low-level radioactive waste? There should be a classification that is accepted across the board by the industry. The Department of Energy has a system that contains four separate subclassifications: high-level waste, transuranic waste, intermediate-level waste and low-level waste. The DOE classified low-level waste as that for which shielding is not required to prevent personnel exposure.

The NRC defines only high-level waste in their current regulations. There is, in the process, a waste classification methodology forthcoming which will set maximum concentrations for the various isotopes. The concentration limits will be based on a pathway analysis of all

credible release paths from a disposal site such that certain dose guidelines are not exceeded. The State of Pennsylvania suggests that the wastes can be further categorized as to source; nuclear fuel cycle waste and non-fuel cycle waste.

3. Even the government reports only the magnitude of the improbable events. As an example, Sandia just completed a study of the consequences if there were an accident involving plutonium or spent nuclear fuel during its shipment through a populated area of the Pacific Northwest or Alaska. Using New York as a study base, Sandia found that the consequences of such an accident could involve \$2 billion in decontamination costs, 3,964 latent cancer fatalities, 952 early morbidities and 18 early fatalities.
4. The attitude in our industry today is very similar to that of being in "limbo." For example, the regulatory agencies appear to be moving slowly in making decisions regarding low-level waste. One only has to look at the status of high-level waste to know that there is chaos; and low-level waste is following suit. It is my feeling that low-level waste could be the "tail wagging the dog." As an example of the lack of recognition of the magnitude of the problem, one DOT official was recently asked, and it was reported in Nucleonics Week, why there was not an official government position regarding transportation of radioactive waste. His response was, "I personally have not seen anything to indicate an emergency. I doubt that the DOT will jump into the fray to make a precipitous decision."

This is not the real world.

5. Is the hazardous toxic chemical waste problem a problem that will overshadow the radioactive waste problem shortly? Studies have shown that from a quantity of waste standpoint, hazardous chemical wastes range from 100 to 1,000 times greater.

How will we handle this waste? In comparing the annual waste generation by a 1,000 MWe coal-fired plant versus a 1,000 MWe nuclear plant, one finds the ft^3/year to be of similar magnitude (a little greater than $6 \times 10^6 \text{ ft}^3 \text{ year}$).

6. The problem of solidifying waste is still faced by the industry. Leachability, chemical companies becoming reluctant to sell their chemicals for solidification purposes, and viability of the container after many years is under question.
7. When the NRC lowers the maximum worker radiation dose limit, the costs of handling at the burial sites and transportation will increase.
8. The 1976 AIF report, "A Survey and Evaluation of Handling and Disposing of Solid Low-Level Nuclear Cycle Wastes," projected that the existing licensed burial sites will be filled to capacity by 1988. This was based upon an assumption of $1 \times 10^6 \text{ ft}^3$ of industrial and institutional waste being disposed of annually. Since then the situation has changed with Sheffield closing. How accurate are the projected quantities?
9. Volume reduction must be analyzed technically and economically to determine what impact it has on increasing the life span of the burial grounds and what impact it will have on equipment needs (more shielded casks).
10. There has been some criticism of the shallow land burial technique because of lack of consistent criteria for commercial burial grounds. It is evident that the criteria will vary somewhat due to the location and environment of the burial grounds.

These concerns are not in any way all inclusive but are offered as a starting point for a meaningful discussion.

The bottom line is that unless some steps are taken, an already serious problem could become worse. There are power plants that have such limited storage capacity that if Barnwell were to close down, and if radwaste disposal vendors could not provide adequate shipping casks for hauling the waste to the West Coast, these plants would be faced with closing down due to radwaste disposal problems. Also, the question arises as to the "fairness" of asking the Western part of the United States to bear the waste load of an industry that is most strongly visible east of the Mississippi. Transportation problems must also be considered in this scenario. It is about time that we take this situation in hand before it becomes a much more serious problem.