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OCT 28 1975

The Honorable John O. Pastore
Chairman, Joint Committee on
Atomic Energy
United States Congress

Dear Mr. Chairman:

On May 23, 1975, the Joint Committee on Atomic Energy requested us to review allegations that coal shipped to the Energy Research and Development Administration Y-12 plant at Oak Ridge, Tennessee, has contained large amounts of dirt. We examined these allegations and specifically evaluated the procedures for insuring that coal shipments to the Y-12 plant are free of foreign materials and for determining the quality of coal received.

We met with responsible Energy Research and Development Administration officials, officials and employees of the contractor operating the Y-12 plant, and members of the group involved in making the allegation. We discussed coal-sampling standards and procedures with officials of the American Society for Testing and Materials and the U.S. Department of the Interior, Bureau of Mines. The American Society for Testing and Materials, which consists of members from Government and private industry, has established and issued standards for coal sampling and analysis. We observed the receipt of coal shipments at the Y-12 plant and requested a test sample be obtained and analyzed. We also examined and evaluated pertinent records and procedures.

The quality of coal delivered to the Y-12 plant--operated under a cost-plus-fixed-fee contract by the Union Carbide Corporation, Nuclear Division--is determined by collecting and analyzing samples taken from coal received at the plant. Carbide's analyses of the coal delivered by Shemco, Inc.--the company alleged to be including large amounts of dirt in coal shipments to the Y-12 plant--did not support the allegation. Our review of Carbide's sampling procedures and practices, however, disclosed that they did not collect a sample which was representative of the entire load of coal and that a more representative sample was needed to better identify the coal quality. Accordingly, we concluded that Carbide's sampling procedures needed to be revised

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to insure that a representative sample was taken, for better determining the coal quality received at the Y-12 plant.

We discussed the contents of this report with Energy Research and Development Administration and Carbide officials. They agree with our conclusions and plan to revise Y-12 coal-sampling procedures.

INTRODUCTION

Carbide purchases coal to produce steam for temperature and humidity control in Y-12 plant buildings.

Before 1974 natural gas was used in place of coal for several months each year. Since 1974, however, the Y-12 plant has used coal exclusively. The estimated average daily use of coal is 350 tons.

During fiscal years 1971 through 1975, Carbide purchased about 490,000 tons of coal for the Y-12 plant at a delivered cost of about $7.7 million. Carbide has contracted for delivery of 125,000 tons at a cost of $2,789,750 during the first 6 months of fiscal year 1976. As of July 1, 1975, the Y-12 plant had a coal inventory of over 76,000 tons.

Y-12 COAL PROCUREMENT PROCEDURES

After the needed quantity of coal is determined and approved, bids are requested. Sealed bids are received from those coal companies and agents interested in selling all or part of the coal to be purchased.

Contracts for the required or available quantity are awarded to the lowest bidders on the basis of the lowest cost for a million Btu's. The contracts contain a provision that at least 50 percent of the loads are to be sampled for coal quality. Payment for coal is based on the contracted price adjusted for differences in contracted and delivered quality. The price adjustment for quality is determined by the British thermal unit content as received according to analysis of coal samples. The latest contracts contain the provision that:

> "For deviations in the bid and delivered heat content of more than 25 BTU, a penalty or premium will be calculated on a straight percentage basis. For example, with a coal price of $10 per ton and a bid BTU value of 12,800, the adjusted coal price for 12,500 BTU coal would be 12,500/12,800 x $10 = $9.77. A premium would be calculated in like manner."

Past experience on coal purchases

A comparison of the quality of the coal purchased and received for the Y-12 plant during fiscal years 1971 through 1975 follows.

Fiscal year	Average British thermal units Contracted	Received	Net premium or penalty (-)
1975	12,000	11,849	-$31,254
1974	12,307	12,357	[a]-9,148
1973	12,657	12,885	26,139
1972	12,276	11,790	-17,760
1971	12,642	12,131	-11,174

[a]In fiscal year 1974 the average British thermal unit received exceeded the average contracted by 50 Btu's but there were penalties assessed against four suppliers totaling $49,161 and premiums paid to two suppliers totaling $40,013 for a net penalty of $9,148.

Carbide officials told us they have received some poor quality coal at the Y-12 plant. They said that when delivery of poor quality coal is detected, they try to persuade the supplier to improve the coal quality. They said the knowledge that a penalty will be assessed for delivering lower quality coal or the contract could be cancelled has been sufficient to convince suppliers to improve the coal quality. For additional information regarding coal purchases during fiscal years 1971 through 1975, see the appendix.

ALLEGATION REGARDING COAL DELIVERED TO THE Y-12 PLANT

In testimony before the Subcommittee on Oversight and Investigations, House Committee on Interstate and Foreign Commerce on May 2, 1975, representatives of Save Our Cumberland Mountains--a citizens' organization trying to stop abuses to people and land by large land and coal companies--made an allegation that coal being sent to the Y-12 plant by Shemco, Inc. included large amounts of dirt. The Y-12 plant sample analyses of coal delivered by Shemco, Inc. do not support the allegation.

During our review members of Save Our Cumberland Mountains repeated the allegation to us and described the

circumstances relative to the allegation. They told us that:

--On or about May 15, 1974, they observed trucks at a Shemco, Inc. coalyard being loaded from two separate piles of coal. The quality of the coal in the two piles was different, with one pile of obviously poorer quality. During the loading two scoops of poorer quality coal were first placed in the center of the empty truck and then the load completed with coal from the better quality pile. This method of loading, layer loading, was an effort to conceal poor quality coal with better quality. Later that day some trucks, not necessarily the trucks observed earlier, were seen leaving the coalyard and going to the Y-12 plant.

--On June 28, 1974, trucks were again observed being layer loaded at the same coalyard. They said one truck, identified by the number 44, was later seen coming out of the Y-12 plant.

A Y-12 plant official told us that Y-12 plant records did not show whether the identified truck had delivered coal to the Y-12 plant on the date in question. At the Y-12 plant, a coal truck is not generally identified or recorded by the number painted on it but rather from a number assigned by the supplier on a mine delivery ticket. We were informed by Carbide officials that the number assigned may not conform to the number on the truck.

On June 28, 1974, 40 truckloads of coal were received at the Y-12 plant from Shemco, Inc. Carbide records show that 22 of the 40 truckloads were sampled with two resultant analyses of 12,163 Btu's and 11,906 Btu's. The contracted value was 12,324 Btu's. The two analyses were made on composite samples each taken from 10 trucks. Samples taken from the other two trucks were combined with samples from trucks delivering at a later date. After a sample is taken, coal is spread and packed into the coal pile. At this point, the coal loses its identity relative to supplier and quality.

Shemco, Inc. delivered over 40,000 tons of coal to the Y-12 plant during April through July 1974. On the basis of analyses of samples taken throughout delivery, coal quality averaged 12,777 Btu's and the company received a $35,659 premium for delivering coal of higher quality than contracted. Shemco, Inc. has not delivered coal to the Y-12 plant since July 1974.

SAMPLING PROCEDURES

The coal sample forms the basis for determining the actual coal quality received and the amount paid. Assuming that the sample is representative, it should disclose the actual British thermal unit value which is the measure of quality. The varying characteristics of coal and the presence of foreign material will affect this value. Before about 3 years ago, sampling procedures at the Y-12 plant involved taking sample increments from the top of the load of coal before it was dumped. Carbide changed its sampling procedures to better identify quality by taking sample increments from the dumped load of coal.

When the truck arrives at the Y-12 plant, it is weighed and directed to one of two coal piles. The coal is dumped on top of the pile, and the truck is weighed empty. Sample increments are taken from at least 50 percent of the truckloads of coal delivered under each contract. Three sample increments are taken from each truckload sampled. The increments are taken after the coal has been dumped and from three places around the dumped pile about halfway up the slope of the pile and at least 1-foot deep into the pile. After the sampler obtains the increments, the coal is spread and packed into the pile before the sample analysis results are known. About 20 pounds of coal are collected from each sampled load and retained until increments have been collected from 10 contractor truckloads. Later, usually that evening, the collected sample is crushed and placed in two 1/2-gallon containers.

A half gallon of each sample is submitted to the Y-12 laboratory for analysis and the other half gallon is retained in case of disputes until the contract has been completed. After about 2 weeks, the results of the analyses are available. A Carbide official informed us that the Y-12 laboratory analysis is made according to American Society for Testing and Materials standards. The analyses include data on such items as moisture, ash, sulfur content and British thermal unit value. The accuracy of the Y-12 laboratory procedures is verified by internal control samples and occasionally is compared with analyses of samples prepared for Carbide by the Bureau of Mines. A Y-12 laboratory official told us the Bureau of Mines analyses confirmed the reasonableness of the Y-12 plant analyses.

EVALUATION OF Y-12 SAMPLING PROCEDURES

We evaluated Y-12 sampling procedures by reviewing the written procedures and comparing them with coal sampling

standards published by the American Society for Testing and Materials, observing actual practice, and by obtaining a test sample. We concluded that the Y-12 written procedures have not been tested for statistical validity and are not explicit enough in guiding and instructing coal-sampling personnel. We believe this has led to personnel not obtaining representative samples, not protecting coal samples from changes in composition, and operating without a sampling plan based on statistical sampling standards.

Representative sampling

The American Society for Testing and Materials standard states:

> "It is essential that the [sample] increments be distributed throughout the lot to be sampled. This distribution is related to the entire volume of the lot, not merely its surface or any linear direction through it, or over it. If circumstances prevent the sampler from applying this principle, the lot is sampled only in part, and the gross sample is representative only of this part."

The Y-12 written procedures provide for taking the sample at three places in the dumped pile with all three samples taken from an area about halfway up the slope of the pile and at least 1 foot deep into the pile. Y-12 officials told us that if the sampler observed that he was not obtaining a representative sample through this method, he could obtain samples from other locations of the dumped pile including the center. To have the dumped pile cut into to obtain a sample assumes that someone knowledgeable of the varying characteristics of coal quality will observe the coal as it is unloaded and spread over the pile.

Coal samplers are personnel assigned from other jobs within the plant, and some have limited knowledge of the varying characteristics of coal. This option to obtain samples from other locations is not included in the Y-12 written procedures, and no one we talked to could tell us how often it was used. Furthermore, the Y-12 written procedures do not instruct the sampler to observe coal as it is received and spread.

Our observations of coal-sampling practices showed that the coal sampler did not observe the coal either as it was unloaded or as it was spread over the pile. We also observed that for each load of coal sampled, the coal sampler followed the Y-12 written procedures by taking all three samples about

halfway up the slope of the pile. The coal sampler also dug a short distance into the pile to obtain the samples, often with coal from higher up the slope sliding down into the area where the sample was being obtained. In effect, the Y-12 sampling practice we observed allowed for collecting and analyzing the outer layer of a coal load, which according to the American Society for Testing and Materials standard does not provide a representative sample of the entire load.

We requested a test sample be taken from the center of the dumped piles to compare with the sample taken by the usual method. The analyses of these two samples were:

	Regular	Test
Percent moisture, total	4.23	6.02
Percent ash, dry	26.44	32.15
Percent sulfur, dry	.86	.83
Btu/lb., dry	10,563	9,668
Btu/lb., ash and moisture free	14,360	14,249
Btu/lb., as received	10,117	9,087

Both samples were taken from the same truckloads of coal. As the table above shows, the test sample taken from the center of the piles contained a greater percentage of moisture and ash. In addition, the test sample analyzed over 1,000 Btu's a pound less than the regular sample, which was the basis for payment.

The test sample demonstrates the possibility of varying characteristics between coal samples obtained from the outer layer of a coal pile and those obtained from the center of a pile.

Protection from changes in composition

The American Society for Testing and Materials standard states:

> "The increments obtained during the sampling period shall be protected from changes in composition due to exposure to rain, snow, wind, sun, contact with absorbent materials and extremes of temperature. * * * Metal cans with air-tight lids, or heavy vapor-impervious bags, properly sealed, are satisfactory for this purpose."

The Y-12 written procedures do not discuss protection from changes in composition. During observations of the coal-sampling procedure, we noted that sample increments are placed in open metal containers in which they are retained until crushed and the final sample placed in sealed glass jars. Metal containers containing samples covered by a canvas were observed in only one instance.

Statistical sampling standards

The American Society for Testing and Materials standard states:

> "A satisfactory sampling arrangement is one that takes an unbiased sample at the desired degree of precision of the constituent for which the sample is to be analyzed."

It also provides that, "Sampling systems shall be tested initially and at regular intervals to determine whether the sample adequately represents the coal."

Carbide officials told us that the Y-12 sampling procedures were based on studies conducted 20 to 30 years ago. These studies are no longer available. The Y-12 procedures have not been evaluated for statistical validity since that time, and Carbide officials could not tell us the precision or confidence level of their sampling procedures.

RECOMMENDATION TO THE ADMINISTRATOR, ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

We recommend that the Administrator require Carbide to revise its coal-sampling procedures at the Y-12 plant to incorporate the American Society for Testing and Materials standards.

AGENCY COMMENTS

Energy Research and Development Administration officials told us that they have started to review the coal-sampling procedures at Y-12 and that the procedures will be revised to incorporate applicable American Society for Testing and Materials standards.

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Section 236 of the Legislative Reorganization Act of 1970 requires the head of a Federal agency to submit a written statement on actions he has taken on our recommendations to

the House and Senate Committees on Government Operations not later than 60 days from the date of the release of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the release of the report. We will be in touch with your office to arrange for the release of the report to set in motion the requirements of section 236.

Sincerely yours,

Acting Comptroller General
of the United States

Y-12 Plant Coal Purchase Data
FY 1971 to 1975

FY	Tons contracted	Average cost a ton	Contracted cost	Tons delivered	Delivered cost	Penalty (-) or premium	Average cost a ton
1975	107,080	$30.03	$3,215,236.00	107,657,360	$3,201,012.61	-$31,254.17	$29.73
1974	125,000	16.11	2,013,402.50	127,858,720	2,022,267.82	-9,148.34	15.82
1973	50,000	9.32	466,013.00	55,262,110	541,041.76	26,138.77	9.79
1972	90,000	8.73	785,650.00	90,893,040	773,655.72	-17,759.58	8.51
1971	100,950	10.37	1,047,378.00	108,208,740	1,113,530.74	-11,173.78	10.29

Note: As discussed in this report, problems were found with the Y-12 sampling procedures and these problems could have an impact on the British thermal unit value received and the amount paid.