UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

FEB 14 1966

Mr. John T. Conway
Executive Director
Joint Committee on Atomic Energy
Congress of the United States

Dear John:

I am responding to your letter of February 8, 1966, enclosing a list of questions.

General

1. Q: Has AEC's basic 1956 policy decision not to impose physical security controls been reviewed prior to this time?

   A: There has been no formal policy review of this question prior to this time. In 1964, however, the General Manager approved procedures under which the controls on SNM under a contract involving financial responsibility for loss would become consistent with the financial responsibility policy established in 1956 for lessees.

2. Q: Is it being reviewed now, and can you describe your tentative conclusions?

   A: Yes, the 1956 policy is under active review but no conclusions have yet been reached.

3. Q: Describe the organization set up to study this overall problem. Tell us the charter of the study group.

   A: As one facet of this review an ad hoc committee under the direction of Allan Labowitz and consisting of representatives from the Director of Regulation and the Divisions of International Affairs, Security, and Nuclear Materials Management has been established to assemble into a single document for Commission review and possible action all AEC policies and procedures for the safeguards of special nuclear material held either under domestic or foreign commitments.

This report is intended to identify those areas where responsibilities between the several parts of the AEC organization may not be clear, where requirements may be inconsistent, and where enforcement rights may be in question.

Preceding the Labowitz committee, the Director of Regulation and the General Manager have collaborated in studies on several recognized areas, where overlaps in responsibilities occur, e.g., accountability at mixed facilities, physical security control at mixed facilities, delineation of the interfaces between Regulation and Operation, and designation of focal points. The response to your letter of December 3, 1965, contained in Chairman Seaborg's reply of January 25, 1966, is the result of a collaborative review.

4. Q: Are you considering any immediate or long-range organizational changes?

   A: The Commission will consider both immediate and long-range organizational changes, should current studies indicate the need.

5. Q: Describe some of the changes in AEC regulations and contract requirements being considered.

   A: The Director of Regulation is now developing proposed revisions to the AEC regulations (10 CFR 70) which would extend existing transfer and reporting requirements to cover privately-owned special nuclear material, in addition to that owned by the AEC and leased to industry. Some additional aspects that are being studied are:

   a. Whether the regulations or individual licenses should set forth the responsibility of the licensee to guard against theft or diversion of special nuclear material but without stipulating precise techniques which he would be required to follow.

   b. Whether licensees should be required by regulation to conduct inventories not less often than annually in accordance with minimum standards.

No changes are being considered in contract requirements.

6. Q: What requirements if any are imposed on licensees concerning maintenance of accountability? Are you considering imposing detailed inventory and record-keeping procedures on licensees?

A: AEC Regulations (10 CFR 70) contain the requirements discussed below. It should be noted that in addition to these requirements explicitly for the purpose of accountability, there are numerous additional requirements directed toward health and safety but which when followed by a licensee aid in accountability of special nuclear materials.

70.51 requires that each licensee keep records showing the receipt, inventory and transfer of special nuclear material.

70.52 requires that any losses other than normal operating losses of special nuclear materials be reported promptly to the Commission.

70.53 requires each licensee to submit to the Commission reports of special nuclear materials distributed pursuant to section 53 and received, transferred or possessed by the licensee, or for which the licensee is financially responsible. These reports are required as of December 31 and June 30 of each year and are to be filed within 30 days after the end of the period covered by the report. Where losses or burn-up of less than 10 grams occur and no receipts or shipments had been made during a report period, the December 31 report is the only one required.

70.54 requires each licensee who transfers and each licensee who receives special nuclear material to submit a report of each such transfer of special nuclear material distributed by the Commission pursuant to section 53 promptly after such transfer takes place.

The Commission is not considering imposing precise inventory and record-keeping details on licensees for the reason that details appropriate for one licensed operation would almost surely not provide management the details necessary in another operation. However, as noted in the response to Question 5, the Commission is considering establishing minimum guidelines and standards within which the licensee could design his own internal record system to assure that it most appropriately meets his needs, while still being responsive to the AEC requirements.

7. Q: How does the AEC's safeguards system for licensees who are not contractors, and who are, compare with the IAEA system?

A: The purpose of the IAEA inspection is to detect whether or not material is being diverted for military uses. Domestic inspections determine whether or not material is being used for the purpose intended and establish the cause and reasonableness of losses. The technical methods employed during IAEA inspections are similar to those followed in nuclear materials surveys of licensees; however, the frequency of IAEA inspection may now be higher for certain facilities, such as Yankee. Differences in procedural details are being reviewed as a part of the Labowitz Study.

8. Q: Is accountability at AEC facilities handled differently than at licensee facilities? Is AEC also reviewing its system of accountability for contractors exempt from licensing?

A: Yes, there are a number of significant differences. All AEC facilities are operated on cost-type contracts. The current AEC inventory, exclusive of materials transferred to DoD, is about $5 billion. The AEC, therefore, in its management role, has set up requirements on its operating contractors who, within those guidelines, and subject to AEC approval, develop detailed practices designed to minimize losses consistent with the process. Close surveillance by the AEC is maintained over discards and waste streams and, in particular, on accumulations of large quantities of unmeasured scrap. Where the AEC has considered that additional accountability actions at one of its facilities are necessary, such actions are taken.

No special review is being made of the AEC system of accountability for contractors exempt from licensing. A number of such reviews has been made over the past 15 years, the most recent in 1960 by the Stanford Research Institute.

6 C

9. Q: Are any processing facilities in the United States not subject to AEC inspection, e.g., any DoD installations, State licensed facilities?

A: All special nuclear material except that delivered to the Department of Defense by direction of the President under Section 91B is subject to some form of AEC inspection.

NUMEC

1. Q: Please answer the four questions raised in Mr. Holifield's February 2, 1966 letter.

a. Q: What specific actions has the AEC taken since discovery of the NUMEC loss to determine if similar situations exist at other licensed processing, conversion and fabrication facilities?

A: Process losses and materials unaccounted for as reported to the AEC by other plants and resulting from accountability surveys made during the past year have not raised questions which could not be resolved quickly to the AEC's satisfaction. Our personnel conducting nuclear material surveys have satisfied themselves that the reported normal operational losses were within acceptable limits.

b. Q: What is the basis of the statement in Mr. Hollingsworth's letter that "no evidence has been developed that would suggest that the /NUMEC/ losses occurred under circumstances that would indicate possible diversion"?

A: The nuclear materials survey performed in November at NUMEC was specifically designed to ascertain the nature of the losses and the disposition of the materials. This survey went far beyond that which is normally performed at contractor-licensee plants in that the physical inventory tests were more extensive. For example, 731 air filters were examined by gamma spectrometry and 177 containers of combustible waste were similarly verified. That survey revealed no evidence which would lead us to believe or suspect that the material had been diverted.

c. Q: Has the AEC determined whether an inquiry by the AEC's Division of Inspection, or the Federal Bureau of Investigation, is warranted?

A: In the absence of evidence or suspicion of violation of law, we have determined that an inquiry by the FBI is not now warranted. Our Division of Inspection is presently reviewing the survey report and a determination has not been made as to the need for further inquiry by that Division.

d. Q: What specific action has the AEC taken, or does the AEC plan to take, to improve the AEC's regulations, requirements and procedures to help assure that losses such as those described above do not go undetected for long periods of time?

A: The General Manager and the Director of Regulation have underway a number of studies jointly and cooperatively undertaken to ascertain the possible need for additional control by regulation or by direction. These studies are being pursued diligently with a view toward completion at the earliest possible time. As soon as the Commission has completed its review we shall advise the Committee of any actions we intend to take.

2. Q: Did inspections by persons reporting directly to the Director of Regulation disclose any irregularities at NUMEC?

A: There were no irregularities of a safeguards nature; some infractions of health and safety requirements were noted and action taken to correct them satisfactorily.

3. Q: How do you derive $764,000 from 61 kilograms of U-235?

A: The dollar value of losses cannot be derived by a direct multiplication of quantities unaccounted for times the dollar value per kilogram, except under the unusual situation where the isotopic ratio of materials received, shipped, lost, or on inventory, is identical one with the other. Rather, the value of losses is derived by evaluating material delivered to NUMEC and subtracting therefrom the value returned by NUMEC, further subtracting the value of the remaining inventory. Because much of the material at NUMEC associated with the Westinghouse Astronuclear job has been degraded, the

estimated loss of $764,000 includes not only the value of material missing, but also reflects the loss in value of the inventory remaining as it has been degraded from 93% to an average of approximately 16% U-235. Thus we derived the value of the "loss" as follows:

STATUS OF WANL CONTRACT

	U-235 (kg)	Thousand $[1]
UF_6 delivered	1012	$12,181.4
Returns to WANL and to OR	919	11,055.1[2]
Total which NUMEC is obligated to return to AEC or pay for	93	1,126.3[2]
Inventory as of October 31, 1965	32[4]	362.7
Loss	61[4]	$ 763.6[3][4]

(1) The dollar value of each line except "Loss" was derived by direct multiplication of individual components of each category.

(2) For purposes of this computation credit has been given for UF_6 heels returned by NUMEC. Contractually NUMEC is obligated to pay for these heels.

(3) This value is derived by subtraction as discussed above.

(4) Upon recovery of the residues before November 23, 1966, these quantities, and the corresponding dollars, may be adjusted upward or downward. Adjustments could result from recovery of more or less U-235 than estimated to be in inventory or should the isotopic ratio be different from that estimated.

4. Q: Please discuss the final results of the survey at NUMEC.

A: The survey of NUMEC encompassed two primary objectives:

a. to determine the total cumulative U-235 "loss"(1) for the NUMEC Apollo plant operation since start-up in 1957 and to evaluate the extent to which such "losses" could be accounted for in terms of known loss mechanisms (e.g., liquid wastes, stack gases, burial ground disposals), and measurement biases in order to arrive at a material-unaccounted-for quantity(2); and

b. to attempt to find explanations for the unexpectedly high U-235 loss (about 6% of total U-235 received) attributed by NUMEC to the Westinghouse Astronuclear Laboratory (WANL) Purchase Order 59-NP-12674.

The survey disclosed a total cumulative loss of 178 kg U-235 since plant start-up in 1957. This represents 1.21% of total receipts of 14,693 kg U-235. Of this 178 kg, known loss mechanisms have been established for 84.2 kg or 0.57%, leaving a material-unaccounted-for of 93.8 kg or 0.64% based on total NUMEC receipts.

---

(1) "Loss" as used here means the difference resulting from the total cumulative U-235 received by NUMEC, less the sum of (a) total cumulative shipments of U-235 by NUMEC to others, and (b) NUMEC's physical inventory of U-235 as of 10/31/65.

(2) Material unaccounted for (MUF) occurs when, after a physical inventory of a plant, there is a difference between the physical inventory and the book inventory after the latter has been adjusted for accidental losses, normal operational losses (discharge to tanks, sewers, stacks, burial grounds, etc.) and other known removals of material. Thus, MUF is usually the result of uncertainties of measurements, unknown losses and undetected errors.

The estimate of all the discards are tabulated as follows:

	U-235 (Kg)
Accidental losses	3.0
Normal operational losses:	
(a) Liquid waste effluent discards	58.0
(b) Burial pit discards (non-recoverable contaminated earth burden)	2.2
(c) Stack gas losses	14.0
(d) Liquid waste in storage drums	2.0
(e) Trackout, contaminated laundry and shoe covers	5.0
	84.2

In addition to the above known discards NUMEC has exhumed 5.5 kg U-235 from the 1963 burial pit which has now been brought back on to the physical inventory.

The survey indicates that the total loss attributed to the WANL contract will be about 60.8 kg U-235, as against the earlier estimates of 52.6 kg U-235.

While it is not possible to reconstruct the specific events which resulted in this high loss, certain circumstances as described by NUMEC have led to the following conclusions.

NUMEC's cumulative losses from time of plant start-up in 1957 have been higher than those determined by other companies having comparable operations. NUMEC underestimated its process losses. Adequate documentation of internal plant transfers was not maintained. Losses on individual contracts as they occurred were not established. As a result, this accumulation of unrecorded and unreported losses from prior contracts continued and became a recognized loss when the inventory was at a low level following completion of the WANL contract, when NUMEC's own accountability methods improved, and as a result of an AEC survey conducted in April, 1965. The report reflects that the WANL contract became the final repository of these cumulative losses. The reflection of this cumulative loss as a WANL contract loss is largely attributable to the inability of NUMEC to maintain continued identity of material

as to the contract for which it was originally received. It should be noted, however, that in their scrap recovery operation, as distinguished from their fabrication processes, the very nature of the operation results in the loss of contract identity.

The survey team concluded that a major contributing factor to these circumstances was that NUMEC management had not assigned the necessary caliber of full-time professional talent to the complex job of materials management. The NUMEC Corporation has advised the AEC that they too now recognize the need for a thorough professional and high-level materials management staff.

5. Q: Please discuss discrepancy between the amount billed ($1,134,849.34) and the amount "lost" ($764,000).

A: The amount billed ($1,134,849.34) is based on the contract which provided that at a specified date, which has terminated, NUMEC would reimburse WANL for the value of SNM charged to its account less the value of the SNM returned to the AEC.

The amount "lost" ($764,000) is based on the difference between the amount billed and the estimated value for material held on inventory October 31, 1965.

Additional Questions

A. Q: Are mass balance inspections for inventories made or required by the AEC?

A: Yes, but only for proprietary reasons to assure correct payment to the AEC for losses of SNM. Surveys of fixed-price contractors/licensees are not designed to meet safeguard control objectives. For example, they do not inquire into the nature, magnitude and disposition of losses as such surveys do at our CPFF contractors. Although much information of a safeguards nature is derived from such proprietary type surveys, it is incidental to the primary objective of ascertaining correct payments for losses.

CONFIDENTIAL

B. Q: Please provide data on processing losses, including the magnitude thereof.

A: In order to achieve a common understanding of the term "losses" the definition as used in the NUMEC report is repeated. "Loss means the difference resulting from the total cumulative U-235 received less the sum of (a) total cumulative shipments of U-235 to others, and (b) physical inventory of U-235."

The total cumulative loss expressed as a percent of total cumulative receipts is given for each of the following companies:

Company	Loss (%)	Kg U-235 Loss	Kg U-235 Receipt
Minnesota Mining & Manufacturing Co.	0.59	11	1,861
Nuclear Fuel Services	0.61	132	21,575
United Nuclear Corp.	0.28	67	23,142
Kerr McGee	0.48	5	1,041
NUMEC	1.21	178	14,693

C. Q: Do AEC inspectors themselves perform analyses of samples?

A: No. The AEC's New Brunswick Laboratory (New Brunswick, New Jersey) is utilized for analyses.

D. Q: In connection with losses at NUMEC, please state:

(i) Kgs -- The total cumulative loss at NUMEC since plant start-up in 1957 has been established as 178 kg U-235, pending final recovery of residues.

(ii) Enrichment -- The quantity of 178 kg U-235 represents enriched material ranging from slightly enriched to fully enriched at 93.15% U-235. Some special nuclear material enriched greater than 93.15% has also been processed at NUMEC.

(iii) Dollar Value -- The dollar value of 178 kg U-235 based on $12,000 per kg U-235 at 93% enrichment calculates to about $2,136,000.

(iv) Whether interest charges are included -- In general most fixed price contracts call for payment of loss at the time contract is closed. Some contracts, e.g., the WANL contract, contain provisions which assess interest charges on outstanding losses after certain time periods set forth in the contract. NUMEC has been assessed at 4 3/4% per annum, a use-charge on the value of the material not returned, from January 28, 1965 through December 23, 1965. On that date NUMEC paid the AEC $500,000. Effective that date interest charges at the rate of 6% on the unpaid bill ($634,849.34) accrue.

(v) Whether the loss includes normal process loss -- Yes, the loss at NUMEC does include normal processing losses. The loss as used in reference to NUMEC means the difference resulting from the total cumulative U-235 received by NUMEC, less the sum of (a) total cumulative shipments of U-235 by NUMEC to others, and (b) NUMEC's physical inventory of U-235 as of October 31, 1965. In the case of NUMEC this would include accidental losses, normal operational losses (discharge to tanks, sewers, stacks, burial grounds, etc.) and other known removals of materials as well as any unknown losses or undetected errors and measurement uncertainties.

E. Q: Are AEC special nuclear material licensees and fixed price contractors liable for "normal processing losses"?

A: Yes. In addition to normal process losses they are liable for all other losses sustained, including material-unaccounted-for. In general, they are liable for all losses resulting from the difference between material received less (a) the product delivered, and (b) acceptable recovered scrap returned to the AEC.

F. Q: Are other licensees being checked for losses in view of the experience at NUMEC?

A: Licensees have been checked for losses prior to the experience at NUMEC from the standpoint of establishing losses to ensure correct financial payment to the AEC. While the NUMEC experience did not affect the checking of losses in this regard, it has re-emphasized the need to determine on a current basis (and not at time of contract close-out) the magnitude, nature, disposition and reasonableness of such losses.

~~CONFIDENTIAL~~

GK

If there is any additional information which you might wish, please do not hesitate to contact me or my staff.

Sincerely yours,

SIGNED, E. B. HOLLINGSWORTH

General Manager

~~CONFIDENTIAL~~