File

Office of the Attorney General
Washington, D. C.

April 25, 1979

MEMORANDUM TO: Attorney General

FROM: Frederick D. Baron FDB

RE: NUMEC Investigation

On March 22, 1979, an article in the New York Times referred to the fact that the FBI and CIA had refused access to GAO to examine classified material from their files pertinent to the NUMEC investigation of allegations of diversion of nuclear material from a plant in Apollo, Pennsylvania.

Jack Keeney in the Criminal Division indicated, by way of background, that you wrote the Comptroller General on February 9, 1978, refusing GAO access to the Department's files because the NUMEC investigation was still continuing. The Internal Security Section has now completed a detailed review of thousands of CIA documents and is preparing a report. On the basis of this document review, some further investigation by the FBI will be necessary. Termination of the investigation will depend in large measure on the results of the Bureau's investigation.

Jack Keeney believes that upon completion of the review, we should give serious consideration to making the materials available to an appropriate committee of Congress.

cc: John C. Keeney

Jack Davitt

Noted
GBB
4/30/79

Office of the Attorney General
Washington, D. C.

April 25, 1979

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cc: John C. Keeney

Jack Davitt

Re- ~~Appeal~~ NUMEC

UNITED STATES GOVERNMENT

memorandum

APR 17 1979

DATE:

REPLY TO ATTN OF: John C. Keeney
Deputy Assistant Attorney General
Criminal Division

JCK:JHD:TEM:njs
146-41-15-3112

SUBJECT: NUMEC Investigation

TO: The Attorney General

RECEIVED
DEPARTMENT OF JUSTICE
OFFICE OF THE ATTORNEY GENERAL
APR 18 1979

By a memorandum dated April 2, 1979, Frederick B. Baron requested that I summarize the background of our refusal to allow the GAO to examine classified material from our files on the NUMEC matter, as was reported in an article in the March 22, 1979 edition of The New York Times.

As the article indicates, the Comptroller General, in a letter to Chairman Dingell of the House Subcommittee on Energy and Power, discussed the refusal of the FBI and the CIA last year to allow the GAO to examine classified material concerning the NUMEC matter. The article did not indicate that the Department, other than the FBI, had refused access to GAO.

In this regard, however, by letter to the Comptroller General, dated February 9, 1978, a copy of which is attached hereto, you declined to permit the GAO to have access to the Department's files because the NUMEC investigation was continuing.

In answer to Mr. Baron's question, the Internal Security Section's task force has completed its detailed review of the thousands of CIA documents, and its report on that aspect of the matter is being prepared. In addition, it is reviewing the FBI's investigation and is preparing directions to the FBI on additional matters that must be covered. Unfortunately, it is not possible to make any intelligent prediction as to when the NUMEC investigation will be concluded by the Internal Security Section. The reason is that it has been our past experience that new vistas have opened up just when it has been concluded that the investigation could be terminated. For example, we only learned as a result of a letter to you from Senator Baker last year (copy attached) that the CIA had a substantial number of documents of relevance to this case. Our review of these documents generated, in part, the need of further specific investigation by the FBI which, as I have indicated, we intend to seek.

Thus, the termination of the investigation will depend, in large measure, on the results of the Bureau's investigation.

Finally, in response to the question of making documents available to GAO once the NUMEC investigation is closed, I believe that upon completion of our review, we should give serious consideration to making the materials available to an appropriate committee of Congress.

GBB:BRC:JHD:TEM:dbm
Typed: 1/13/78
146-41-15-3112

FEB 8 1978

Honorable Elmer B. Staats
Comptroller General of the
United States
Washington, D. C. 20548

Dear Mr. Staats:

This is in response to your letter to me, dated December 16, 1977, requesting access to records, reports and files in the possession of this Department which relate to the Nuclear Materials and Equipment Corporation (NUMEC) of Apollo, Pennsylvania. Your inquiry into this matter was at the request of Chairman Dingell of the House Subcommittee on Energy and Power. You also requested to be informed of the scope of our investigation and the estimated date of its completion.

As you may know, in response to a similar request from Chairman Dingell, the Deputy Attorney General informed him, by letter dated September 8, 1977, that Department policy has been to provide oral briefings by the FBI to Congressional committees which have inquired about this matter. Such a briefing was offered to Chairman Dingell.

The recent meeting of FBI representatives with Mr. Canfield, Director of the GAO Energy and Minerals Division and members of his staff, to which you refer in your letter, was in fact a briefing by the FBI as a result of the Acting Comptroller General's letter to me of August 30, 1977.

cc: Records
Mr. Civiletti
[redacted]
Atty. Hold
Hold

In view of the fact that our investigation into this matter is continuing, I am not able to accede to your request at this time. Consideration will, of course, be given to your request upon the conclusion of our investigation.

I am unable to estimate when the investigation will be concluded. You may be assured, however, that it is being carried out as expeditiously as possible.

Yours sincerely,

Griffin B. Bell
Attorney General

HOWARD HENRY BAKER, JR.
TENN.

United States Senate

OFFICE OF THE MINORITY LEADER
WASHINGTON, D.C. 20510

June 28, 1978

Honorable Griffin B. Bell
Attorney General
Department of Justice
Washington, D.C.

Dear Mr. Attorney General:

On June 21, 1978, the Central Intelligence Agency provided Mr. George F. Murphy, Jr., the Director of the Senate Office of Classified National Security Information, with a recently discovered classified file pertaining to the subject matter of my previous letters to you of March 2, August 4, and October 25 of last year. I have today reviewed the information in that file, a portion of which appears to be extremely significant and previously unknown to me. I believe that the importance and sensitivity of this information merits your personal attention.

I am asking the Director of Central Intelligence to ensure that the Senate Select Committee on Intelligence is promptly provided with this file. As I indicated in my previous correspondence, I would appreciate being kept informed of current developments in this area of long-standing interest to me. Likewise, please do not hesitate to advise if I may be of assistance to you in this matter.

Best personal regards.

Sincerely,

Howard H. Baker, Jr.

HHBJr:lnt

SPECIAL ASSISTANT TO
THE ATTORNEY GENERAL

April 2, 1979

To: Jack Keeney

From: Frederick D. Baron FDB

Re: NUMEC

An article by David Burnham in the New York Times on March 22, referred to an accusation by the Comptroller General in a letter to Congressman Dingell that the Department of Justice refused to allow GAO to examine classified material about missing uranium from the NUMEC plant.

Please ask the appropriate person in the Criminal Division to prepare a very short note to the Attorney General summarizing the background of the refusal to provide documents to GAO.

When will the Internal Security Section complete their review of the NUMEC case?

Once the Criminal Division closes the NUMEC case, should documents be made available to GAO?

WITHDRAWAL NOTICE

RG: 65 Records of the Federal Bureau of Investigation

Classified Files of the Special Assistant of the AG, Frederick D. Baron, 1977

NND PROJECT NUMBER: 74857 FOIA CASE NUMBER: 37114

WITHDRAWAL DATE: **09/07/2012**

BOX: 00007 FOLDER: 0 TAB: 1 DOC ID: 31977200

COPIES: 1 PAGES: 3

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

FOLDER TITLE: NUMEC: GAO Investigation

DOCUMENT DATE: 02/28/1979 DOCUMENT TYPE: Letter

FROM: Civiletti

TO: The President

SUBJECT:

This document has been withdrawn for the following reason(s):

NSI 36 CFR 1256.46

WITHDRAWAL NOTICE

WITHDRAWAL NOTICE

RG: 65 Records of the Federal Bureau of Investigation

Classified Files of the Special Assistant of the AG, Frederick D. Baron, 1977

NND PROJECT NUMBER: 74857 FOIA CASE NUMBER: 37114

WITHDRAWAL DATE: **09/07/2012**

BOX: 00007 FOLDER: 0 TAB: 2 DOC ID: 31977201

COPIES: 1 PAGES: 4

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

FOLDER TITLE: NUMEC: GAO Investigation

DOCUMENT DATE: 02/23/1979 DOCUMENT TYPE: Memorandum

FROM: Director, FBI

TO: Deputy Attorney General

SUBJECT: Review of Nuclear Materials Safeguards

This document has been withdrawn for the following reason(s):

NSI 36 CFR 1256.46

WITHDRAWAL NOTICE

WITHDRAWAL NOTICE

RG: 65 Records of the Federal Bureau of Investigation

Classified Files of the Special Assistant of the AG, Frederick D. Baron, 1977

NND PROJECT NUMBER: 74857 FOIA CASE NUMBER: 37114

WITHDRAWAL DATE: **09/07/2012**

BOX: 00007 FOLDER: 0 TAB: 3 DOC ID: 31977202

COPIES: 1 PAGES: 2

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

FOLDER TITLE: NUMEC: GAO Investigation

DOCUMENT DATE: 02/12/1979 DOCUMENT TYPE: Memorandum

FROM: Heymann

TO: Civiletti

SUBJECT: Nuclear Material Safeguards

This document has been withdrawn for the following reason(s):

NSI 36 CFR 1256.46

WITHDRAWAL NOTICE

WITHDRAWAL NOTICE

RG: 65 Records of the Federal Bureau of Investigation

Classified Files of the Special Assistant of the AG, Frederick D. Baron, 1977

NND PROJECT NUMBER: 74857 FOIA CASE NUMBER: 37114

WITHDRAWAL DATE: **09/07/2012**

BOX: 00007 FOLDER: 0 TAB: 4 DOC ID: 31977203

COPIES: 1 PAGES: 1

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

FOLDER TITLE: NUMEC: GAO Investigation

DOCUMENT DATE: 02/08/1979 DOCUMENT TYPE: Memorandum

FROM: Baron

TO: Civiletti

SUBJECT: Nuclear Material Safeguards

This document has been withdrawn for the following reason(s):

NSI 36 CFR 1256.46

WITHDRAWAL NOTICE

COUNSELOR TO THE
ATTORNEY GENERAL

Feb. 6, 1979

TO: Benjamin Civiletti
Deputy Attorney General

FROM: Mike Kelly

Ben: please handle and acknowledge for me.

GBB 2/5/79

[redacted]

COUNSELOR TO THE
ATTORNEY GENERAL

Feb. 5, 1979

TO: Judge Bell

FROM: Mike Kelly

I suggest you let Ben Civiletti coordinate this response with the assistance of the Criminal Division and the FBI.

Ben: please handle
+ advise. for me.
GBB
2/5/79

WITHDRAWAL NOTICE

RG: 65 Records of the Federal Bureau of Investigation

Classified Files of the Special Assistant of the AG, Frederick D. Baron, 1977

NND PROJECT NUMBER: 74857 FOIA CASE NUMBER: 37114

WITHDRAWAL DATE: **09/07/2012**

BOX: 00007 FOLDER: 0 TAB: 5 DOC ID: 31977204

COPIES: 1 PAGES: 1

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

FOLDER TITLE: NUMEC: GAO Investigation

DOCUMENT DATE: 02/01/1979 DOCUMENT TYPE: Memorandum

FROM: The President

TO:

SUBJECT: Review of Nuclear Material Safeguards

This document has been withdrawn for the following reason(s):

NSI 36 CFR 1256.46

WITHDRAWAL NOTICE

------JSUPP
2 19:47:52 02/01/79

AA JOROM
1 19:57:26 02/01/79
.5167 0322241

TTEZYUW RUEHFBA0117 0322200-EEEE--RUEBWJA.
ZNY EEEEE
0121472 FEB 79
FM DIRECTOR FBI
TO RUEAIWW/WHITE HOUSE SITUATION ROOM
ATTN: NATIONAL SECURITY COUNCIL
RUEBWJA/ATTORNEY GENERAL
RUEBWJA/DEPUTY ATTORNEY GENERAL
ATTN: EMERGENCY PROGRAMS CENTER
RUEBWJA/ASSISTANT ATTORNEY GENERAL, CRIMINAL DIVISION
ATTN: MR. JOE TAPE, INTERNAL SECURITY SECTION
ATTN: GENERAL CRIMES SECTION
RUEKJCS/DIRECTOR DEFENSE INTELLIGENCE AGENCY
RUEHSE/U.S. SECRET SERVICE (PIL)
RHEGNRC/NUCLEAR REGULATORY COMMISSION
RHEGGTN/DEPARTMENT OF ENERGY
ATTN: MR. MARTIN LOWD
BT
UNCLAS E F T O
UNKNOWN SUBJECTS; THEFT OF 66 KILOGRAMS OF 2.6 PERCENT ENRICHED

PAGE TWO DE RUEIFB 0117UNCLAS E F T O
URANIUM FROM GENERAL ELECTRIC LOW ENRICHED URANIUM PLANT, WILMINGTON, NORTH CAROLINA, JANUARY 29, 1979; ATOMIC ENERGY ACT - EXTORTION

INVESTIGATION HAS DEVELOPED NUMEROUS POSSIBLE SUSPECTS. HOWEVER, INVESTIGATION NOW FOCUSING ON ONE PRIME SUSPECT. BACKGROUND IS AS FOLLOWS:

AT APPROXIMATELY 5:40 P.M., JANUARY 30, 1979, A CALL WAS RECEIVED AT RESIDENCE OF RANDALL T. ALKEMA, MANAGER OF CAPTIONED PLANT. ALKEMA'S WIFE TOOK THE CALL IN HIS ABSENCE. SHE ASKED THE CALLER TO IDENTIFY HIMSELF SEVERAL TIMES, BUT HE DID NOT RESPOND. WHEN PRESSED, THE CALLER APPEARED TO BECOME NERVOUS. HE SAID THAT HE WORKED AT THE PLANT FOR "BOG" (PHONETIC) IN MAINTENANCE AND WOULD CALL BACK LATER. MRS. ALKEMA DESCRIBED THE CALLER AS A WHITE MALE, 25 TO 30, WHO SOUNDED TO BE INTELLIGENT WITH A POSSIBLE MID-WESTERN ACCENT. HE SOUNDED NERVOUS AND HAD EXCITED BREATHING. AT FIRST, HIS TONE WAS AGGRESSIVE UNTIL SHE INSISTED ON KNOWING HIS IDENTITY. A TRAP PLACED ON THIS LINE REVEALED THAT THE CALL TO THAT RESIDENCE ORIGINATED FROM TELEPHONE NUMBER 919/799-6106. A REPRESENTATIVE OF SOUTHERN BELL TELEPHONE COMPANY IDENTIFIED THE

LE BUEHFE 0117 UNCLAS \ E F T O

. THE . AS STEVEN W. DALE, 5102 BELGRADE CIRCLE, WILMINGTON,
CRI LINA. CONTACT WITH MR. ALKEMA DETERMINED DALE IS
H C T HIS PLANT AS HEAD OF THE CHEMICAL MAINTENANCE UNIT.
OYE ISED DALE HAS NEVER CALLED HIM AT HIS HOME AND
EMA SUCH A CALL TO BE MOST UNUSUAL. THE ONLY REASON HE
SIDE K OF FOR DALE TO CALL HIM AT HOME WOULD BE FOR A
D T OF A MAJOR PIECE OF EQUIPMENT AT THE PLANT. IF SUCH
AKDO SE, ALKEMA FEELS THE CALL WOULD HAVE ORIGINATED FROM
THE AND NOT FROM DALE'S HOME. HE ALSO FEELS THAT DALE
PLA IDENTIFIED HIMSELF AND WOULD HAVE CALLED HIM BACK.
LD H DALE DID NOT CALL BACK THE NIGHT OF JANUARY 30, 1979,
WHE FAILED TO CALL BACK ON THE MORNING OF JANUARY 31, 1979,
ALSO S MADE WITH DALE'S SUPERVISOR WHO ADVISED THAT THERE
TAC NO BREAKDOWN OF EQUIPMENT IN THE PLANT ON THE EVENING
BEE 30, 1979, AND FOLLOWING THE PROPER CHAIN OF COMMAND,
JANUA NOT HAVE CONTACTED ALKEMA WITHOUT FIRST CONTACTING
E WOU UPERVISOR ALSO FELT CERTAIN THAT DALE WOULD HAVE
. THE HIMSELF AND EXPLAINED THE NATURE OF THE CALL AND
NTI CALLED BACK IF HE SAID HE INTENDED TO. THE SUPER-
E A NTARILY FURNISHED THAT DALE'S BROTHER, DAVID DEARNED

LE BUEHFE 0117 UNCLAS E F T O

ALE, IS STAYING WITH HIM. THE BROTHER WORKS FOR DANIEL'S
ONSTRUCTION, A SUBCONTRACTOR AT THE PLANT AND HAS BEEN SO
MPLOYED FOR THE PAST SIX OR EIGHT WEEKS. HE IS WORKING AS A
ABORATORY ASSISTANT AT THE PLANT. HIS SUPERVISOR AT DANIEL'S
S ROGER TEEL. THE BROTHER HAD BEEN LIVING IN THE CARIBBEAN
RIOR TO COMING TO WILMINGTON AND IS DUE TO TERMINATE HIS
MPLOYMENT SOME TIME BETWEEN FEBRUARY 10 THROUGH 15, 1979. HE
S DESCRIBED AS A "TRANSIENT" TYPE AND HAS SPOKEN OF PLANS TO
E TO CALIFORNIA AFTER LEAVING WILMINGTON. DAVID DALE IS
ESCRIBED AS A WHITE MALE, AGE 30, 5 FEET 10 INCHES, 130 POUNDS,
EDIUM BUILD, LONG HAIR WORN APPROXIMATELY COLLAR LENGTH,
USTACHE, AND TAN COMPLEXION.
A REVIEW OF DAVID DALE'S EMPLOYMENT APPLICATION REFLECTS
HAT HE IS, WHITE MALE BORN SEPTEMBER 13, 1939, 6 FEET TALL,
70 POUNDS, SAN 260-51-2565, SERVED IN THE UNITED STATES ARMY
PECIAL FORCES FROM 1961 TO 1963, AND HAS A BACHELOR'S DEGREE
LIBERAL ARTS FROM THE UNIVERSITY OF MIAMI AT MIAMI, FLORIDA.
IS PREVIOUS EMPLOYMENT WAS LISTED AS A BOAT CAPTAIN IN THE
ETHERLANDS ANTILLES AND PUERTO RICO. THE APPLICATION FORM
AS PRINTED AND BORE SOME SIMILARITY TO THE UNTRAINED EYE TO

AGE FIVE DE RUEHFE 0117 UNCLAS E F T O
IE PRINTING IN EXTORTION LETTER RECEIVED BY ALKEMA.
FURTHER CONTACT WITH GENERAL ELECTRIC PERSONNEL DETERMINED
IAT DAVID DALE'S IMMEDIATE SUPERVISOR HAS BEEN OUT OF TOWN AND
IAT HE WAS UNDER VERY LIMITED SUPERVISION FOR THE PERIOD OF
PROXIMATELY THE PAST WEEK. VIALS OF THE TYPE RECEIVED BY
OTH ALKEMA AND "WILMINGTON STAR NEWS" ARE USED IN DAVID DALE'S
ORK AREA.
ADDITIONAL INVESTIGATION CONCERNING DAVID DALE DISCLOSED
IAT HE WAS THE AUTHOR OF THE EXTORTION LETTER AND BASED ON
IAT AND OTHER FACTORS, AN ARREST WARRANT WAS ISSUED FOR HIS
REST ON FEBRUARY 1, 1979, FOR VIOLATION OF THE HOBBS ACT -
XTORTION. DAVID DALE WAS ARRESTED WITHOUT INCIDENT AND WILL
E BROUGHT BEFORE A U. S. MAGISTRATE AS SOON AS POSSIBLE.
NVESTIGATION TO LOCATE AND RETRIEVE THE NUCLEAR MATERIAL
LLEGED TO HAVE BEEN STOLEN IS CONTINUING.
T
0117

NNN

11 20:06:51 02/01/79

[redacted]

COUNSELOR TO THE
ATTORNEY GENERAL

April 3, 1979

TO: Frederick Baron

FROM: Mike Kelly

Hold on to this in case the letter needs to be brought to Judge Bell's attention.

File - NUMEC

COUNSELOR TO THE
ATTORNEY GENERAL

Feb. 26, 1979

TO: Frederick Baron

FROM: Mike Kelly

Should this go to the Attorney General?

cautionary note from the DAG explaining that the matter is already being dealt with by Heymann.
FDB

To Mike Kelly 3/31/79

There is no need to send this to the AG. Phil Heymann will review the merits of the CECO case and the AG does not need to become involved. This is simply a [redacted]

OPTIONAL FORM NO. 10
JULY 1973 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : Griffin B. Bell
Attorney General

DATE: February 16, 1979

FROM : Benjamin R. Civiletti
Deputy Attorney General

SUBJECT: Correspondence From Congressman Annunzio Concerning Investigation of Commonwealth Edison Company of Illinois

Congressman Frank Annunzio sent your office and mine a legal memorandum prepared on behalf of the Commonwealth Edison Company of Illinois (CECO) by its attorneys, Isham, Lincoln & Beale. Copies of the memorandum and my response are attached.

The memorandum details CECO's contention that its activities at its Quad Cities nuclear plant did not violate any federal law (i.e., 18 USC 371, 1001 or 42 USC 2273).

The Government Regulations and Labor Section of the Criminal Division and the United States Attorney for the Southern District of Illinois have been investigating CECO's activities. Both of these offices have copies of the attached legal memorandum, and it is my understanding that each office is preparing a memorandum on the prosecutive merits of the case to be sent to and reviewed by Phil Heymann.

Attachments

THE DEPUTY ATTORNEY GENERAL
WASHINGTON, D.C. 20530

February 14, 1979

Honorable Frank Annunzio
U. S. House of Representatives
Washington, D. C. 20515

Dear Frank:

I received the legal memorandum on behalf of the Commonwealth Edison Company (CECO) you forwarded to me through Ray Calamaro. You can be sure that I will refer it to the appropriate part of the Department and to the Attorney General's office.

Thank you for expressing your concern and for your consideration.

Sincerely,

Benjamin R. Civiletti

Dear General:

This will confirm our telephone conversation today. Whether or not an indictment against Commonwealth Edison Company should be sought by reason of the events alleged to have occurred at Quad Cities Station is a matter which only the Department can decide. My purpose in calling you was simply to emphasize the importance of the decision in terms of the national interest and to state my belief that it was, therefore, essential that the matter be decided at a high policy level.

An indictment against Commonwealth Edison Company would, in my opinion, have a severe impact both on the Company as a leader in the nuclear power field and on the nuclear industry generally. I share the Administration's belief that nuclear power plants are an essential option for the country in meeting its energy needs in the future. An indictment of Commonwealth Edison Company with respect to matters dealing with its operation of a nuclear power plant and which are subject, in any event, to the comprehensive regulation of the Nuclear Regulatory Commission would, undoubtedly, have an adverse effect on the country's energy situation. This is not a reason for not proceeding against Commonwealth Edison Company; it is a reason for considering with care whether criminal action, as distinguished from the civil remedies available under the Atomic Energy Act, is the proper course if, indeed, any action is justified.

Sincerely,

CONFIDENTIAL

MEMORANDUM

We understand that the Criminal Division of the United States Department of Justice is concluding its investigation of Commonwealth Edison Company ("Ceco") in connection with alleged violations of 18 U.S.C. §1001 and 42 U.S.C. 2273 arising out of the administration of the industrial security plan at Ceco's Quad Cities nuclear power station. Ceco has attempted to cooperate fully with this investigation. The focus of the investigation apparently is an alleged failure by Ceco personnel to provide for the maintenance of proper guard patrol records with respect to certain doors. These doors, which provide access between working areas within the plant, had been designated as entries to "vital areas" within Ceco's Quad-Cities Nuclear Power Plant. The securing of vital area doors, but not the maintenance of records relating to those doors, was a requirement of Ceco's Security Plan and implementing procedures, all of which had been adopted in accordance with regulations of the United States Nuclear Regulatory Commission ("NRC")*.

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* Pursuant to the Energy Reorganization Act of 1974, the licensing functions of the Atomic Energy Commission, including all matters dealing with security at nuclear power plants were transferred to the NRC. All references will be to the NRC.

It is the purpose of this memorandum to set forth why Ceco believes the investigation and Criminal Division involvement in this matter should be terminated. In view of the specific facts and circumstances involved in the putative offense as well as the fact that the NRC exercises continuous oversight of all of Ceco's activities at the Quad-Cities station and has authority to levy civil penalties for violations of regulatory requirements, resort to criminal process is inappropriate and unnecessary.

I. Regulatory Requirements Relating to Industrial Security at Nuclear Power Plants were first established after the Quad Cities plant was built and operating and have been changing ever since. Ceco has made a vigorous, good faith effort to solve the resulting problems of complying with such regulations.

The basic rationale behind the NRC's industrial security regulations is to protect the health and safety of the public from an uncontrolled release of radioactivity due to sabotage at a nuclear power plant. It should be stressed at the outset that none of the occurrences at Quad-Cities investigated by the Department of Justice involved actual or threatened sabotage or led to any release of radioactivity or any danger to the health and safety of the public. At the time that Ceco obtained a construction permit from the NRC for Quad-Cities there were no industrial security regulations. The absence of regulations led to the design of a plant which

did not specifically provide for industrial security nor include any features which would ease the implementation of a security program. Most of the Quad-Cities operating force was in place by mid-1971 for training and pre-operational testing, first power was generated in October, 1971, and the plant went into commercial service in August, 1972. The plant's personnel established work practices and procedures, based on free movement within the plant and easy access to all work areas, which facilitated maintenance and operation Most Ceco employees at Quad-Cities had prior experience at the Company's fossil-fueled plants, where industrial security practices are minimal and unrestricted movement from area to area is the general rule.

The first NRC guidelines for nuclear plant security were set forth in a document entitled Safety Guide 17 which was published on October 21, 1971. This safety guide was not a binding regulation, was cast in rather general terms, and did not discuss specific recommendations with respect to locking doors to vital areas at existing plants.

In November of 1973 the NRC first published binding regulations with respect to industrial security for nuclear power plants, but these simply required the submission of formal security plans, limited the licensee's flexibility in revising such plans and referenced Regulatory Guide 1.17, a document similar in format to Safety Guide 17. Pursuant to these regulations, Ceco submitted its first security plan for Quad Cities Station which was approved by the NRC in May, 1974. In addition to the 22-page plan, Ceco developed

nearly 100 pages of implementing procedures which were reviewed by the NRC.*

The May, 1974 Security Plan and its implementing procedures required for the first time that "vital areas" be designated within the plant and access to those areas controlled. Because the design of Quad-Cities had not forseen this requirement, vital areas were not conveniently grouped, nor were walls in place to segregate vital areas. Accordingly, large areas of the plant had to be designated as vital areas even though they included many areas that were both not "vital" and required frequent attention from operating personnel. Plant and contractor personnel who had previously had unrestricted access to most of these areas, now had to pass through locked doors in the routine performance of their duties. Since this caused a substantial modification in employee work practices, and impeded maintenance, the locked doors were regarded as a

---

* In order to make the necessary additions and modifications to the facility to implement the requirements of the Security Plan, Ceco spent in excess of $635,000, exclusive of the costs associated with the employment of a guard service.

nuisance and instances where doors were blocked open took place. Moreover, the locks on the doors which had been designated vital area doors were not capable of withstanding the constant use to which they were subjected and failures of the locking mechanism were frequent. Thus, in order to comply with the requirements of Quad-Cities' Security Plan, significant changes were necessary both in the physical characteristics of the plant and in work practices, and these had to be coupled with a new awareness by employees of the importance of complying with industrial security requirements. Ceco's implementation of the original Security Plan was also complicated by more detailed and stringent industrial security regulations proposed by the NRC in 1974. Refinement of the original security plan and its procedures were superseded by planning for compliance with the new regulations.

For all the reasons detailed above, compliance with the requirements of the Security Plan regarding control of access to vital areas was difficult. The response of station management personnel to this situation was a constant, conscientious effort to reduce the incidence of open vital area doors. The guard service was asked to include vital area doors in their routine patrols of the inner perimeter fence, punch-clock stations were installed so that the patrols could be monitored and guards were asked to close any open vital area doors which they observed during their routine patrols. Open vital area doors and the necessity for locking them were brought to the attention of station employees by their shift supervisors and by periodic meetings held by the station superintendent. Guard personnel were asked continually to inform responsible Ceco employees at the station, in writing, of any open doors that were observed. Nonetheless, open vital area doors continued to occur at Quad-Cities.

These problems with unsecured doors did not pose substantial security risks to the Quad-Cities plant. All of these doors were doors used only by individuals who had already been checked by the security force at the outside gates. The locking of those doors also represented only one of several procedures and devices which protected the internal security of the plant's vital areas. Nevertheless, Ceco was

seriously concerned with the existence of these problems because the Company has always been committed to strict compliance with all regulatory requirements, including those relating to industrial security.

A. There was no violation of any provision of the Atomic Energy Act or NRC regulations.

It is incontestable that there was no requirement in NRC regulations that guards record open vital area doors. The security plan itself contains no requirement that vital areas be patrolled or that records of open vital area doors be maintained, but only states that "[i]mplementing procedures provide for records and reports of ... patrols". Thus, at most, the Security Plan itself contemplated that there would be procedures which would describe the records and reports of patrols. Indeed, the only reporting requirement for security guards found in the security plan is that the guards maintain records of all tests and responses to intrusion alarms or threats to plant security. The security plan does state that "station personnel are trained to report ... unlocked doors to their supervisor" and such reports are documented in the shift engineer's log during this time period. There are no procedures which provide for records and reports of patrols of vital areas by the guard service since the security plan provided that Ceco personnel themselves would inspect

these areas continuously as a part of their normal routine. Since guard service patrols of vital area doors were instituted on an informal basis, no written procedures were prepared for reporting those patrols. NRC knew that the guard service was patrolling the vital area doors and that there was no procedure for reporting such patrols.

In the absence of any procedure requiring reports of patrols, informal records of such patrols were maintained. Punch-clock tapes from the punch-clocks installed near vital area doors were retained. In addition, open vital area doors were noted by guards on two forms devised by the Pinkerton guard service and not referred to in the security plan or procedures. These forms are the "Inner Patrol Sheet" and the "Security Service Report, Form 286B". The former was designed to record the status of gates in the inner perimeter fence and the latter was a standard guard service form used basically to record guard personnel attendance.

B. Any violation of the Security Plan or its implementing procedures and any failure to disclose open vital area doors to the NRC was not willful.

Any incidence of open vital area doors always increased during periodic refueling outages at Quad-Cities, when large numbers of transient contractor personnel were present. In an effort to better control vital area doors immediately prior to one such refueling outage in early 1976, guard personnel were asked to direct a specific note of open

doors to the station superintendent rather than noting such doors on the forms referred to above. This change was also intended to alleviate the misplaced concern of the Ceco employee with security responsibility at Quad-Cities that the records of open vital area doors would reflect unfavorably on his performance. It should be stressed that guard personnel were not asked to discontinue their efforts to control open vital area doors nor to stop informing Ceco personnel of any open doors. Rather, specific directions designed to inform station management continuously were issued. Thus, Ceco's efforts to control this problem were not impaired. For example, as previously noted, reports by Ceco personnel of open vital area doors continued to be recorded in writing by the shift engineer on documents that were available for inspection by the NRC.

Record of open vital area doors prepared by the guard service which were in existence when the change in reporting methods took place were not destroyed. Other records, in station logs and other documents available for regulatory inspection, described the occurrence of open vital area doors and were maintained throughout the entire time period. They demonstrate that Ceco was both diligent in attempting to control the vital area door problem and

open about its existence. Allegations by disgruntled ex-Pinkerton employees regarding failures to record open vital area doors, as well as a variety of other asserted security-related violations, were brought to the attention of Ceco management in early 1977. Ceco promptly notified the NRC of the allegations, investigated the matter itself, reported its findings to the NRC* and has cooperated fully with both the NRC and Department of Justice investigation. In these circumstances, the element of willfulness which is a basic element of the statutes applicable to this matter appears wholly insubstantial.

It is also important to note that Ceco as a company never engaged in any policy or practice with the intent of deceiving the government. Any interpretation of the Security Plan and procedures as requiring records of patrols of vital area doors can only be based on a hyper-technical, legalistic parsing of those documents, inconsistent with the day to day practical interpretation of the Plan and procedures by operating personnel. In this connection, it is noteworthy that the NRC specifically reviewed and approved the plan and procedures and was well aware of the difficulties encountered in controlling access to vital areas at the Quad-Cities Station. The decision to change the method of reporting un-secured doors was not one of corporate policy, but rather was

---

* Letters, Bolger (Ceco) to Keppler (NRC), Mar. 25, 1977 and Apr, 28, 1977.

File

Office of the Attorney General
Washington, D. C.

April 25, 1979

MEMORANDUM TO: Attorney General

FROM: Frederick D. Baron FDB

RE: NUMEC Investigation

On March 22, 1979, an article in the New York Times referred to the fact that the FBI and CIA had refused access to GAO to examine classified material from their files pertinent to the NUMEC investigation of allegations of diversion of nuclear material from a plant in Apollo, Pennsylvania.

Jack Keeney in the Criminal Division indicated, by way of background, that you wrote the Comptroller General on February 9, 1978, refusing GAO access to the Department's files because the NUMEC investigation was still continuing. The Internal Security Section has now completed a detailed review of thousands of CIA documents and is preparing a report. On the basis of this document review, some further investigation by the FBI will be necessary. Termination of the investigation will depend in large measure on the results of the Bureau's investigation.

Jack Keeney believes that upon completion of the review, we should give serious consideration to making the materials available to an appropriate committee of Congress.

cc: John C. Keeney

Jack Davitt

Noted
GBB
4/30/79

Office of the Attorney General
Washington, D. C.

April 25, 1979

MEMORANDUM TO: Attorney General

FROM: Frederick D. Baron FDB

RE: NUMEC Investigation

On March 22, 1979, an article in the New York Times referred to the fact that the FBI and CIA had refused access to GAO to examine classified material from their files pertinent to the NUMEC investigation of allegations of diversion of nuclear material from a plant in Apollo, Pennsylvania.

Jack Keeney in the Criminal Division indicated, by way of background, that you wrote the Comptroller General on February 9, 1978, refusing GAO access to the Department's files because the NUMEC investigation was still continuing. The Internal Security Section has now completed a detailed review of thousands of CIA documents and is preparing a report. On the basis of this document review, some further investigation by the FBI will be necessary. Termination of the investigation will depend in large measure on the results of the Bureau's investigation.

Jack Keeney believes that upon completion of the review, we should give serious consideration to making the materials available to an appropriate committee of Congress.

cc: John C. Keeney

Jack Davitt

Re- ~~Appeal~~ NUMEC

UNITED STATES GOVERNMENT

memorandum

APR 17 1979

DATE:

REPLY TO ATTN OF: John C. Keeney
Deputy Assistant Attorney General
Criminal Division

JCK:JHD:TEM:njs
146-41-15-3112

SUBJECT: NUMEC Investigation

TO: The Attorney General

RECEIVED
DEPARTMENT OF JUSTICE
OFFICE OF THE ATTORNEY GENERAL
APR 18 1979

By a memorandum dated April 2, 1979, Frederick B. Baron requested that I summarize the background of our refusal to allow the GAO to examine classified material from our files on the NUMEC matter, as was reported in an article in the March 22, 1979 edition of The New York Times.

As the article indicates, the Comptroller General, in a letter to Chairman Dingell of the House Subcommittee on Energy and Power, discussed the refusal of the FBI and the CIA last year to allow the GAO to examine classified material concerning the NUMEC matter. The article did not indicate that the Department, other than the FBI, had refused access to GAO.

In this regard, however, by letter to the Comptroller General, dated February 9, 1978, a copy of which is attached hereto, you declined to permit the GAO to have access to the Department's files because the NUMEC investigation was continuing.

In answer to Mr. Baron's question, the Internal Security Section's task force has completed its detailed review of the thousands of CIA documents, and its report on that aspect of the matter is being prepared. In addition, it is reviewing the FBI's investigation and is preparing directions to the FBI on additional matters that must be covered. Unfortunately, it is not possible to make any intelligent prediction as to when the NUMEC investigation will be concluded by the Internal Security Section. The reason is that it has been our past experience that new vistas have opened up just when it has been concluded that the investigation could be terminated. For example, we only learned as a result of a letter to you from Senator Baker last year (copy attached) that the CIA had a substantial number of documents of relevance to this case. Our review of these documents generated, in part, the need of further specific investigation by the FBI which, as I have indicated, we intend to seek.

Thus, the termination of the investigation will depend, in large measure, on the results of the Bureau's investigation.

Finally, in response to the question of making documents available to GAO once the NUMEC investigation is closed, I believe that upon completion of our review, we should give serious consideration to making the materials available to an appropriate committee of Congress.

GBB:BRC:JHD:TEM:dbm
Typed: 1/13/78
146-41-15-3112

FEB 8 1978

Honorable Elmer B. Staats
Comptroller General of the
United States
Washington, D. C. 20548

Dear Mr. Staats:

This is in response to your letter to me, dated December 16, 1977, requesting access to records, reports and files in the possession of this Department which relate to the Nuclear Materials and Equipment Corporation (NUMEC) of Apollo, Pennsylvania. Your inquiry into this matter was at the request of Chairman Dingell of the House Subcommittee on Energy and Power. You also requested to be informed of the scope of our investigation and the estimated date of its completion.

As you may know, in response to a similar request from Chairman Dingell, the Deputy Attorney General informed him, by letter dated September 8, 1977, that Department policy has been to provide oral briefings by the FBI to Congressional committees which have inquired about this matter. Such a briefing was offered to Chairman Dingell.

The recent meeting of FBI representatives with Mr. Canfield, Director of the GAO Energy and Minerals Division and members of his staff, to which you refer in your letter, was in fact a briefing by the FBI as a result of the Acting Comptroller General's letter to me of August 30, 1977.

cc: Records
Mr. Civiletti
[redacted]
Atty. Hold
Hold

In view of the fact that our investigation into this matter is continuing, I am not able to accede to your request at this time. Consideration will, of course, be given to your request upon the conclusion of our investigation.

I am unable to estimate when the investigation will be concluded. You may be assured, however, that it is being carried out as expeditiously as possible.

Yours sincerely,

Griffin B. Bell
Attorney General

HOWARD HENRY BAKER, JR.
TENN.

United States Senate

OFFICE OF THE MINORITY LEADER
WASHINGTON, D.C. 20510

June 28, 1978

Honorable Griffin B. Bell
Attorney General
Department of Justice
Washington, D.C.

Dear Mr. Attorney General:

On June 21, 1978, the Central Intelligence Agency provided Mr. George F. Murphy, Jr., the Director of the Senate Office of Classified National Security Information, with a recently discovered classified file pertaining to the subject matter of my previous letters to you of March 2, August 4, and October 25 of last year. I have today reviewed the information in that file, a portion of which appears to be extremely significant and previously unknown to me. I believe that the importance and sensitivity of this information merits your personal attention.

I am asking the Director of Central Intelligence to ensure that the Senate Select Committee on Intelligence is promptly provided with this file. As I indicated in my previous correspondence, I would appreciate being kept informed of current developments in this area of long-standing interest to me. Likewise, please do not hesitate to advise if I may be of assistance to you in this matter.

Best personal regards.

Sincerely,

Howard H. Baker, Jr.

HHBJr:lnt

SPECIAL ASSISTANT TO
THE ATTORNEY GENERAL

April 2, 1979

To: Jack Keeney

From: Frederick D. Baron FDB

Re: NUMEC

An article by David Burnham in the New York Times on March 22, referred to an accusation by the Comptroller General in a letter to Congressman Dingell that the Department of Justice refused to allow GAO to examine classified material about missing uranium from the NUMEC plant.

Please ask the appropriate person in the Criminal Division to prepare a very short note to the Attorney General summarizing the background of the refusal to provide documents to GAO.

When will the Internal Security Section complete their review of the NUMEC case?

Once the Criminal Division closes the NUMEC case, should documents be made available to GAO?

WITHDRAWAL NOTICE

RG: 65 Records of the Federal Bureau of Investigation

Classified Files of the Special Assistant of the AG, Frederick D. Baron, 1977

NND PROJECT NUMBER: 74857 FOIA CASE NUMBER: 37114

WITHDRAWAL DATE: **09/07/2012**

BOX: 00007 FOLDER: 0 TAB: 1 DOC ID: 31977200

COPIES: 1 PAGES: 3

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

FOLDER TITLE: NUMEC: GAO Investigation

DOCUMENT DATE: 02/28/1979 DOCUMENT TYPE: Letter

FROM: Civiletti

TO: The President

SUBJECT:

This document has been withdrawn for the following reason(s):

NSI 36 CFR 1256.46

WITHDRAWAL NOTICE

WITHDRAWAL NOTICE

RG: 65 Records of the Federal Bureau of Investigation

Classified Files of the Special Assistant of the AG, Frederick D. Baron, 1977

NND PROJECT NUMBER: 74857 FOIA CASE NUMBER: 37114

WITHDRAWAL DATE: **09/07/2012**

BOX: 00007 FOLDER: 0 TAB: 2 DOC ID: 31977201

COPIES: 1 PAGES: 4

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

FOLDER TITLE: NUMEC: GAO Investigation

DOCUMENT DATE: 02/23/1979 DOCUMENT TYPE: Memorandum

FROM: Director, FBI

TO: Deputy Attorney General

SUBJECT: Review of Nuclear Materials Safeguards

This document has been withdrawn for the following reason(s):

NSI 36 CFR 1256.46

WITHDRAWAL NOTICE

WITHDRAWAL NOTICE

RG: 65 Records of the Federal Bureau of Investigation

Classified Files of the Special Assistant of the AG, Frederick D. Baron, 1977

NND PROJECT NUMBER: 74857 FOIA CASE NUMBER: 37114

WITHDRAWAL DATE: **09/07/2012**

BOX: 00007 FOLDER: 0 TAB: 3 DOC ID: 31977202

COPIES: 1 PAGES: 2

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

FOLDER TITLE: NUMEC: GAO Investigation

DOCUMENT DATE: 02/12/1979 DOCUMENT TYPE: Memorandum

FROM: Heymann

TO: Civiletti

SUBJECT: Nuclear Material Safeguards

This document has been withdrawn for the following reason(s):

NSI 36 CFR 1256.46

WITHDRAWAL NOTICE

WITHDRAWAL NOTICE

RG: 65 Records of the Federal Bureau of Investigation

Classified Files of the Special Assistant of the AG, Frederick D. Baron, 1977

NND PROJECT NUMBER: 74857 FOIA CASE NUMBER: 37114

WITHDRAWAL DATE: **09/07/2012**

BOX: 00007 FOLDER: 0 TAB: 4 DOC ID: 31977203

COPIES: 1 PAGES: 1

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

FOLDER TITLE: NUMEC: GAO Investigation

DOCUMENT DATE: 02/08/1979 DOCUMENT TYPE: Memorandum

FROM: Baron

TO: Civiletti

SUBJECT: Nuclear Material Safeguards

This document has been withdrawn for the following reason(s):

NSI 36 CFR 1256.46

WITHDRAWAL NOTICE

COUNSELOR TO THE
ATTORNEY GENERAL

Feb. 6, 1979

TO: Benjamin Civiletti
Deputy Attorney General

FROM: Mike Kelly

Ben: please handle and acknowledge for me.

GBB 2/5/79

[redacted]

COUNSELOR TO THE
ATTORNEY GENERAL

Feb. 5, 1979

TO: Judge Bell

FROM: Mike Kelly

I suggest you let Ben Civiletti coordinate this response with the assistance of the Criminal Division and the FBI.

Ben: please handle
+ advise. for me.
GBB
2/5/79

WITHDRAWAL NOTICE

RG: 65 Records of the Federal Bureau of Investigation

Classified Files of the Special Assistant of the AG, Frederick D. Baron, 1977

NND PROJECT NUMBER: 74857 FOIA CASE NUMBER: 37114

WITHDRAWAL DATE: **09/07/2012**

BOX: 00007 FOLDER: 0 TAB: 5 DOC ID: 31977204

COPIES: 1 PAGES: 1

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

FOLDER TITLE: NUMEC: GAO Investigation

DOCUMENT DATE: 02/01/1979 DOCUMENT TYPE: Memorandum

FROM: The President

TO:

SUBJECT: Review of Nuclear Material Safeguards

This document has been withdrawn for the following reason(s):

NSI 36 CFR 1256.46

WITHDRAWAL NOTICE

------JSUPP
2 19:47:52 02/01/79

AA JOROM
1 19:57:26 02/01/79
.5167 0322241

TTEZYUW RUEHFBA0117 0322200-EEEE--RUEBWJA.
ZNY EEEEE
0121472 FEB 79
FM DIRECTOR FBI
TO RUEAIWW/WHITE HOUSE SITUATION ROOM
ATTN: NATIONAL SECURITY COUNCIL
RUEBWJA/ATTORNEY GENERAL
RUEBWJA/DEPUTY ATTORNEY GENERAL
ATTN: EMERGENCY PROGRAMS CENTER
RUEBWJA/ASSISTANT ATTORNEY GENERAL, CRIMINAL DIVISION
ATTN: MR. JOE TAPE, INTERNAL SECURITY SECTION
ATTN: GENERAL CRIMES SECTION
RUEKJCS/DIRECTOR DEFENSE INTELLIGENCE AGENCY
RUEHSE/U.S. SECRET SERVICE (PIL)
RHEGNRC/NUCLEAR REGULATORY COMMISSION
RHEGGTN/DEPARTMENT OF ENERGY
ATTN: MR. MARTIN LOWD
BT
UNCLAS E F T O
UNKNOWN SUBJECTS; THEFT OF 66 KILOGRAMS OF 2.6 PERCENT ENRICHED

PAGE TWO DE RUEIFB 0117UNCLAS E F T O
URANIUM FROM GENERAL ELECTRIC LOW ENRICHED URANIUM PLANT, WILMINGTON, NORTH CAROLINA, JANUARY 29, 1979; ATOMIC ENERGY ACT - EXTORTION

INVESTIGATION HAS DEVELOPED NUMEROUS POSSIBLE SUSPECTS. HOWEVER, INVESTIGATION NOW FOCUSING ON ONE PRIME SUSPECT. BACKGROUND IS AS FOLLOWS:

AT APPROXIMATELY 5:40 P.M., JANUARY 30, 1979, A CALL WAS RECEIVED AT RESIDENCE OF RANDALL T. ALKEMA, MANAGER OF CAPTIONED PLANT. ALKEMA'S WIFE TOOK THE CALL IN HIS ABSENCE. SHE ASKED THE CALLER TO IDENTIFY HIMSELF SEVERAL TIMES, BUT HE DID NOT RESPOND. WHEN PRESSED, THE CALLER APPEARED TO BECOME NERVOUS. HE SAID THAT HE WORKED AT THE PLANT FOR "BOG" (PHONETIC) IN MAINTENANCE AND WOULD CALL BACK LATER. MRS. ALKEMA DESCRIBED THE CALLER AS A WHITE MALE, 25 TO 30, WHO SOUNDED TO BE INTELLIGENT WITH A POSSIBLE MID-WESTERN ACCENT. HE SOUNDED NERVOUS AND HAD EXCITED BREATHING. AT FIRST, HIS TONE WAS AGGRESSIVE UNTIL SHE INSISTED ON KNOWING HIS IDENTITY. A TRAP PLACED ON THIS LINE REVEALED THAT THE CALL TO THAT RESIDENCE ORIGINATED FROM TELEPHONE NUMBER 919/799-6106. A REPRESENTATIVE OF SOUTHERN BELL TELEPHONE COMPANY IDENTIFIED THE

LE RUEHFE 0117 UNCLAS \ F T O
[illegible] AS STEVEN W. DALE, 5102 BELGRADE CIRCLE, WILMINGTON,
[illegible]CRI[illegible]LINA. CONTACT WITH MR. ALKEMA DETERMINED DALE IS
[illegible]H [illegible]T HIS PLANT AS HEAD OF THE CHEMICAL MAINTENANCE UNIT.
[illegible].OYE[illegible]ISED DALE HAS NEVER CALLED HIM\AT HIS HOME AND
[illegible]EMA[illegible] SUCH A CALL TO BE MOST UNUSUAL. THE ONLY REASON HE
[illegible]SIDE[illegible]K OF FOR DALE TO CALL HIM AT HOME WOULD BE FOR A
[illegible].D T[illegible] OF A MAJOR PIECE OF EQUIPMENT AT THE PLANT. IF SUCH
[illegible]A(DO[illegible]SE, ALKEMA FEELS THE CALL WOULD HAVE ORIGINATED FROM
[illegible]THE [illegible]AND NOT FROM DALE'S HOME. HE ALSO FEELS THAT DALE
[illegible]PLA[illegible] IDENTIFIED HIMSELF AND WOULD HAVE CALLED HIM BACK.
[illegible]LD HI[illegible] DALE DID NOT CALL BACK THE NIGHT OF JANUARY 30, 1979,
[illegible]WHE[illegible]AILED TO CALL BACK ON THE MORNING OF JANUARY 31, 1979,
[illegible]ALSO[illegible]S MADE WITH DALE'S SUPERVISOR WHO ADVISED THAT THERE
[illegible]TAC\[illegible]O BREAKDOWN OF EQUIPMENT IN THE PLANT ON THE EVENING
[illegible]BEEN[illegible] 30, 1979, AND FOLLOWING THE PROPER CHAIN OF COMMAND,
[illegible]JANUA[illegible] NOT HAVE CONTACTED ALKEMA WITHOUT FIRST CONTACTING
[illegible].E NOT[illegible] SUPERVISOR ALSO FELT CERTAIN THAT DALE WOULD HAVE
[illegible]. THE[illegible] HIMSELF AND EXPLAINED THE NATURE OF THE CALL AND
[illegible]ENTI[illegible] CALLED BACK IF HE SAID HE INTENDED TO. THE SUPER-
[illegible]LE [illegible]NTARILY FURNISHED THAT DALE'S BROTHER, DAVID LEARNED
[illegible]

[illegible] LE RUEHFE 0117 UNCLAS E F T O
[illegible]ALL, IS STAY[illegible]ING WITH HIM. THE BROTHER WORKS FOR DANIEL'S
[illegible]ONSTRUCTION, [illegible] SUBCONTRACTOR AT THE PLANT AND HAS BEEN SO
[illegible]MPLOYED FOR [illegible]HE PAST SIX OR EIGHT WEEKS. HE IS WORKING AS A
[illegible]ABORATORY [illegible]ISTANT AT THE PLANT. HIS SUPERVISOR AT DANIEL'S
[illegible]S ROGER TEEL[illegible]. THE BROTHER HAD BEEN LIVING IN THE CARIBBEAN
[illegible]RIOR TO COM[illegible]NG TO WILMINGTON AND IS DUE TO TERMINATE HIS
[illegible]MPLOYMENT [illegible]SOME TIME BETWEEN FEBRUARY 10 THROUGH 15, 1979. HE
[illegible]S DESCRIBED[illegible] AS A "TRANSIENT" TYPE AND HAS SPOKEN OF PLANS TO
[illegible]E TO CALIF[illegible]IA AFTER LEAVING WILMINGTON. DAVID DALE IS
[illegible]ESCRIBED [illegible]A WHITE MALE, AGE 30, 5 FEET 10 INCHES, 180 POUNDS,
[illegible]EDIUM BUILD[illegible], LONG HAIR WORN APPROXIMATELY COLLAR LENGTH,
[illegible]USTACHE, [illegible]TAN COMPLEXION.
A REVIEW OF DAVID DALE'S EMPLOYMENT APPLICATION REFLECTS
[illegible]HAT HE IS [illegible]HITE MALE BORN SEPTEMBER 13, 1939, 6 FEET TALL,
[illegible]70 POUNDS, [illegible]AN 260-51-2565, SERVED IN THE UNITED STATES ARMY
[illegible]PECIAL FORCE[illegible] FROM 1961 TO 1963, AND HAS A BACHELOR'S DEGREE
[illegible] LIBERAL AR[illegible]S FROM THE UNIVERSITY OF MIAMI AT MIAMI, FLORIDA.
[illegible]IS PREVIOUS [illegible]PLOYMENT WAS LISTED AS A BOAT CAPTAIN IN THE
[illegible]ETHERLANDS [illegible]NTILLES AND PUERTO RICO. THE APPLICATION FORM
[illegible]AS PRINTED [illegible]AND BORE SOME SIMILARITY TO THE UNTPAINEL EYE TO

AGE FIVE DE RUEHFE 0117 UNCLAS E F T O
IE PRINTING IN EXTORTION LETTER RECEIVED BY ALKEMA.
FURTHER CONTACT WITH GENERAL ELECTRIC PERSONNEL DETERMINED
IAT DAVID DALE'S IMMEDIATE SUPERVISOR HAS BEEN OUT OF TOWN AND
IAT HE WAS UNDER VERY LIMITED SUPERVISION FOR THE PERIOD OF
PROXIMATELY THE PAST WEEK. VIALS OF THE TYPE RECEIVED BY
OTH ALKEMA AND "WILMINGTON STAR NEWS" ARE USED IN DAVID DALE'S
ORK AREA.
ADDITIONAL INVESTIGATION CONCERNING DAVID DALE DISCLOSED
IAT HE WAS THE AUTHOR OF THE EXTORTION LETTER AND BASED ON
IAT AND OTHER FACTORS, AN ARREST WARRANT WAS ISSUED FOR HIS
REST ON FEBRUARY 1, 1979, FOR VIOLATION OF THE HOBBS ACT -
XTORTION. DAVID DALE WAS ARRESTED WITHOUT INCIDENT AND WILL
E BROUGHT BEFORE A U. S. MAGISTRATE AS SOON AS POSSIBLE.
NVESTIGATION TO LOCATE AND RETRIEVE THE NUCLEAR MATERIAL
LLEGED TO HAVE BEEN STOLEN IS CONTINUING.
T
0117

NNN

11 20:06:51 02/01/79

[redacted]

COUNSELOR TO THE
ATTORNEY GENERAL

April 3, 1979

TO: Frederick Baron

FROM: Mike Kelly

Hold on to this in case the letter needs to be brought to Judge Bell's attention.

File - NUMEC

COUNSELOR TO THE
ATTORNEY GENERAL

Feb. 26, 1979

TO: Frederick Baron

FROM: Mike Kelly

Should this go to the Attorney General?

cautionary note from the DAG explaining that the matter is already being dealt with by Heymann.
FDB

To Mike Kelly 3/31/79

There is no need to send this to the AG. Phil Heymann will review the merits of the CECO case and the AG does not need to become involved. This is simply a [redacted]

OPTIONAL FORM NO. 10
JULY 1973 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : Griffin B. Bell
Attorney General

DATE: February 16, 1979

FROM : Benjamin R. Civiletti
Deputy Attorney General

SUBJECT: Correspondence From Congressman Annunzio Concerning Investigation of Commonwealth Edison Company of Illinois

Congressman Frank Annunzio sent your office and mine a legal memorandum prepared on behalf of the Commonwealth Edison Company of Illinois (CECO) by its attorneys, Isham, Lincoln & Beale. Copies of the memorandum and my response are attached.

The memorandum details CECO's contention that its activities at its Quad Cities nuclear plant did not violate any federal law (i.e., 18 USC 371, 1001 or 42 USC 2273).

The Government Regulations and Labor Section of the Criminal Division and the United States Attorney for the Southern District of Illinois have been investigating CECO's activities. Both of these offices have copies of the attached legal memorandum, and it is my understanding that each office is preparing a memorandum on the prosecutive merits of the case to be sent to and reviewed by Phil Heymann.

Attachments

THE DEPUTY ATTORNEY GENERAL
WASHINGTON, D.C. 20530

February 14, 1979

Honorable Frank Annunzio
U. S. House of Representatives
Washington, D. C. 20515

Dear Frank:

I received the legal memorandum on behalf of the Commonwealth Edison Company (CECO) you forwarded to me through Ray Calamaro. You can be sure that I will refer it to the appropriate part of the Department and to the Attorney General's office.

Thank you for expressing your concern and for your consideration.

Sincerely,

Benjamin R. Civiletti

Dear General:

This will confirm our telephone conversation today. Whether or not an indictment against Commonwealth Edison Company should be sought by reason of the events alleged to have occurred at Quad Cities Station is a matter which only the Department can decide. My purpose in calling you was simply to emphasize the importance of the decision in terms of the national interest and to state my belief that it was, therefore, essential that the matter be decided at a high policy level.

An indictment against Commonwealth Edison Company would, in my opinion, have a severe impact both on the Company as a leader in the nuclear power field and on the nuclear industry generally. I share the Administration's belief that nuclear power plants are an essential option for the country in meeting its energy needs in the future. An indictment of Commonwealth Edison Company with respect to matters dealing with its operation of a nuclear power plant and which are subject, in any event, to the comprehensive regulation of the Nuclear Regulatory Commission would, undoubtedly, have an adverse effect on the country's energy situation. This is not a reason for not proceeding against Commonwealth Edison Company; it is a reason for considering with care whether criminal action, as distinguished from the civil remedies available under the Atomic Energy Act, is the proper course if, indeed, any action is justified.

Sincerely,

CONFIDENTIAL

MEMORANDUM

We understand that the Criminal Division of the United States Department of Justice is concluding its investigation of Commonwealth Edison Company ("Ceco") in connection with alleged violations of 18 U.S.C. §1001 and 42 U.S.C. 2273 arising out of the administration of the industrial security plan at Ceco's Quad Cities nuclear power station. Ceco has attempted to cooperate fully with this investigation. The focus of the investigation apparently is an alleged failure by Ceco personnel to provide for the maintenance of proper guard patrol records with respect to certain doors. These doors, which provide access between working areas within the plant, had been designated as entries to "vital areas" within Ceco's Quad-Cities Nuclear Power Plant. The securing of vital area doors, but not the maintenance of records relating to those doors, was a requirement of Ceco's Security Plan and implementing procedures, all of which had been adopted in accordance with regulations of the United States Nuclear Regulatory Commission ("NRC")*.

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* Pursuant to the Energy Reorganization Act of 1974, the licensing functions of the Atomic Energy Commission, including all matters dealing with security at nuclear power plants were transferred to the NRC. All references will be to the NRC.

It is the purpose of this memorandum to set forth why Ceco believes the investigation and Criminal Division involvement in this matter should be terminated. In view of the specific facts and circumstances involved in the putative offense as well as the fact that the NRC exercises continuous oversight of all of Ceco's activities at the Quad-Cities station and has authority to levy civil penalties for violations of regulatory requirements, resort to criminal process is inappropriate and unnecessary.

I. Regulatory Requirements Relating to Industrial Security at Nuclear Power Plants were first established after the Quad Cities plant was built and operating and have been changing ever since. Ceco has made a vigorous, good faith effort to solve the resulting problems of complying with such regulations.

The basic rationale behind the NRC's industrial security regulations is to protect the health and safety of the public from an uncontrolled release of radioactivity due to sabotage at a nuclear power plant. It should be stressed at the outset that none of the occurrences at Quad-Cities investigated by the Department of Justice involved actual or threatened sabotage or led to any release of radioactivity or any danger to the health and safety of the public. At the time that Ceco obtained a construction permit from the NRC for Quad-Cities there were no industrial security regulations. The absence of regulations led to the design of a plant which

did not specifically provide for industrial security nor include any features which would ease the implementation of a security program. Most of the Quad-Cities operating force was in place by mid-1971 for training and pre-operational testing, first power was generated in October, 1971, and the plant went into commercial service in August, 1972. The plant's personnel established work practices and procedures, based on free movement within the plant and easy access to all work areas, which facilitated maintenance and operation Most Ceco employees at Quad-Cities had prior experience at the Company's fossil-fueled plants, where industrial security practices are minimal and unrestricted movement from area to area is the general rule.

The first NRC guidelines for nuclear plant security were set forth in a document entitled Safety Guide 17 which was published on October 21, 1971. This safety guide was not a binding regulation, was cast in rather general terms, and did not discuss specific recommendations with respect to locking doors to vital areas at existing plants.

In November of 1973 the NRC first published binding regulations with respect to industrial security for nuclear power plants, but these simply required the submission of formal security plans, limited the licensee's flexibility in revising such plans and referenced Regulatory Guide 1.17, a document similar in format to Safety Guide 17. Pursuant to these regulations, Ceco submitted its first security plan for Quad Cities Station which was approved by the NRC in May, 1974. In addition to the 22-page plan, Ceco developed

nearly 100 pages of implementing procedures which were reviewed by the NRC.*

The May, 1974 Security Plan and its implementing procedures required for the first time that "vital areas" be designated within the plant and access to those areas controlled. Because the design of Quad-Cities had not forseen this requirement, vital areas were not conveniently grouped, nor were walls in place to segregate vital areas. Accordingly, large areas of the plant had to be designated as vital areas even though they included many areas that were both not "vital" and required frequent attention from operating personnel. Plant and contractor personnel who had previously had unrestricted access to most of these areas, now had to pass through locked doors in the routine performance of their duties. Since this caused a substantial modification in employee work practices, and impeded maintenance, the locked doors were regarded as a

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* In order to make the necessary additions and modifications to the facility to implement the requirements of the Security Plan, Ceco spent in excess of $635,000, exclusive of the costs associated with the employment of a guard service.

nuisance and instances where doors were blocked open took place. Moreover, the locks on the doors which had been designated vital area doors were not capable of withstanding the constant use to which they were subjected and failures of the locking mechanism were frequent. Thus, in order to comply with the requirements of Quad-Cities' Security Plan, significant changes were necessary both in the physical characteristics of the plant and in work practices, and these had to be coupled with a new awareness by employees of the importance of complying with industrial security requirements. Ceco's implementation of the original Security Plan was also complicated by more detailed and stringent industrial security regulations proposed by the NRC in 1974. Refinement of the original security plan and its procedures were superseded by planning for compliance with the new regulations.

For all the reasons detailed above, compliance with the requirements of the Security Plan regarding control of access to vital areas was difficult. The response of station management personnel to this situation was a constant, conscientious effort to reduce the incidence of open vital area doors. The guard service was asked to include vital area doors in their routine patrols of the inner perimeter fence, punch-clock stations were installed so that the patrols could be monitored and guards were asked to close any open vital area doors which they observed during their routine patrols. Open vital area doors and the necessity for locking them were brought to the attention of station employees by their shift supervisors and by periodic meetings held by the station superintendent. Guard personnel were asked continually to inform responsible Ceco employees at the station, in writing, of any open doors that were observed. Nonetheless, open vital area doors continued to occur at Quad-Cities.

These problems with unsecured doors did not pose substantial security risks to the Quad-Cities plant. All of these doors were doors used only by individuals who had already been checked by the security force at the outside gates. The locking of those doors also represented only one of several procedures and devices which protected the internal security of the plant's vital areas. Nevertheless, Ceco was

seriously concerned with the existence of these problems because the Company has always been committed to strict compliance with all regulatory requirements, including those relating to industrial security.

A. There was no violation of any provision of the Atomic Energy Act or NRC regulations.

It is incontestable that there was no requirement in NRC regulations that guards record open vital area doors. The security plan itself contains no requirement that vital areas be patrolled or that records of open vital area doors be maintained, but only states that "[i]mplementing procedures provide for records and reports of ... patrols". Thus, at most, the Security Plan itself contemplated that there would be procedures which would describe the records and reports of patrols. Indeed, the only reporting requirement for security guards found in the security plan is that the guards maintain records of all tests and responses to intrusion alarms or threats to plant security. The security plan does state that "station personnel are trained to report ... unlocked doors to their supervisor" and such reports are documented in the shift engineer's log during this time period. There are no procedures which provide for records and reports of patrols of vital areas by the guard service since the security plan provided that Ceco personnel themselves would inspect

these areas continuously as a part of their normal routine. Since guard service patrols of vital area doors were instituted on an informal basis, no written procedures were prepared for reporting those patrols. NRC knew that the guard service was patrolling the vital area doors and that there was no procedure for reporting such patrols.

In the absence of any procedure requiring reports of patrols, informal records of such patrols were maintained. Punch-clock tapes from the punch-clocks installed near vital area doors were retained. In addition, open vital area doors were noted by guards on two forms devised by the Pinkerton guard service and not referred to in the security plan or procedures. These forms are the "Inner Patrol Sheet" and the "Security Service Report, Form 286B". The former was designed to record the status of gates in the inner perimeter fence and the latter was a standard guard service form used basically to record guard personnel attendance.

B. Any violation of the Security Plan or its implementing procedures and any failure to disclose open vital area doors to the NRC was not willful.

Any incidence of open vital area doors always increased during periodic refueling outages at Quad-Cities, when large numbers of transient contractor personnel were present. In an effort to better control vital area doors immediately prior to one such refueling outage in early 1976, guard personnel were asked to direct a specific note of open

doors to the station superintendent rather than noting such doors on the forms referred to above. This change was also intended to alleviate the misplaced concern of the Ceco employee with security responsibility at Quad-Cities that the records of open vital area doors would reflect unfavorably on his performance. It should be stressed that guard personnel were not asked to discontinue their efforts to control open vital area doors nor to stop informing Ceco personnel of any open doors. Rather, specific directions designed to inform station management continuously were issued. Thus, Ceco's efforts to control this problem were not impaired. For example, as previously noted, reports by Ceco personnel of open vital area doors continued to be recorded in writing by the shift engineer on documents that were available for inspection by the NRC.

Record of open vital area doors prepared by the guard service which were in existence when the change in reporting methods took place were not destroyed. Other records, in station logs and other documents available for regulatory inspection, described the occurrence of open vital area doors and were maintained throughout the entire time period. They demonstrate that Ceco was both diligent in attempting to control the vital area door problem and

open about its existence. Allegations by disgruntled ex-Pinkerton employees regarding failures to record open vital area doors, as well as a variety of other asserted security-related violations, were brought to the attention of Ceco management in early 1977. Ceco promptly notified the NRC of the allegations, investigated the matter itself, reported its findings to the NRC* and has cooperated fully with both the NRC and Department of Justice investigation. In these circumstances, the element of willfulness which is a basic element of the statutes applicable to this matter appears wholly insubstantial.

It is also important to note that Ceco as a company never engaged in any policy or practice with the intent of deceiving the government. Any interpretation of the Security Plan and procedures as requiring records of patrols of vital area doors can only be based on a hyper-technical, legalistic parsing of those documents, inconsistent with the day to day practical interpretation of the Plan and procedures by operating personnel. In this connection, it is noteworthy that the NRC specifically reviewed and approved the plan and procedures and was well aware of the difficulties encountered in controlling access to vital areas at the Quad-Cities Station. The decision to change the method of reporting un-secured doors was not one of corporate policy, but rather was

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* Letters, Bolger (Ceco) to Keppler (NRC), Mar. 25, 1977 and Apr, 28, 1977.

made by employees at Quad-Cities in an exercise of their judgment and discretion. Even if the Department or the NRC now disagrees with their decision, it can hardly be said that Ceco engaged in a course of action which warrants criminal prosecution.

C. The information regarding open vital area doors was not material to the NRC's enforcement activities.

The lack of materiality of the change in the manner in which guards reported open vital area doors is also apparent. The NRC, the agency charged with inspection and enforcement of all aspects of Quad-Cities' compliance with its regulations and the Security Plan was fully aware of the difficulties experienced at Quad-Cities in keeping vital area doors closed. In July, 1975, during a routine NRC inspection, an open vital area door was observed and a civil penalty was imposed by the NRC. Ceco acknowledged the problems it was facing in keeping vital area doors closed and detailed possible hardware changes and the continuing educational efforts which were being implemented to control the problem.* NRC personnel, during the course of routine inspections, were given complete access to all documents maintained at the station, including those which detailed instances when vital area doors had been left open. Finally, NRC has conceded that the change in reporting open vital area doors by the guards did not violate any provision of its regulations, the Security Plan or its implementing procedures.

II. Essential elements of any violation of the criminal code are lacking in this situation.

We believe that the investigation conducted by the Department of Justice has been primarily directed at possible violations of 18 U.S.C. §1001. There are at least two elements of that statute which the foregoing portions of this memorandum demonstrate cannot be established: willfulness and materiality. They are clearly essential components of any successful prosecution under Section 1001. United States v. Lange, 528 F.2d 1280, 1287 (5th Cir. 1976).

The change in the reporting of open vital area doors in January, 1976 resulted in guards omitting notations of open vital area doors on the "Inner Patrol Sheet" and in the comment section of Pinkerton's Form 286B. There was no duty imposed by any statute, NRC regulation, the Quad-Cities Security Plan or its procedures to maintain records of open vital area doors on the Inner Patrol sheet or on Pinkerton's time keeping form. Absent a duty to report such an item, prosecution under Section 1001 for failure to report open vital area doors comes close to infringing on the policy underlying the Fifth Amendment. To avoid prosecution for non-disclosure, one would of necessity have to inform the NRC of facts which themselves might be evidence of a

crime. See United States v. London, 550 F.2d 206 (5th Cir. 1977); Cf. Poonian v. United States, 294 F.2d 74 (9th Cir. 1961). Moreover the omission of open vital area doors on the Inner Patrol Sheet, a form which was not designed to record such events, does not carry with it the implication that the doors were in fact closed. Such an implication is also required before an omission can constitute a violation of Section 1001. Cf. United States v. Lutwak, 344 U.S. 604 (1953).

It may be possible to characterize the checkmarks in the "no" column of the Form 286B with respect to whether open or broken doors or windows were discovered during a guard patrol as an affirmative misrepresentation since, in some instances, doors may in fact have been found open. We recognize that affirmative misrepresentation may constitute a violation of Section 1001, even if there is no duty to make the representation. But the misstatements must always be material, i.e., they must have been of a nature so as to tend to influence the NRC in the performance of its official duties

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*It is apparent from the face of the form that the information recorded on it is not tailored to nuclear power plant security. There are columns on the form for wuch matters as "Smoking Violation" and "Vaults, Safes Open". Indeed the column relating to doors is headed "Doors, Windows, Open, Broken". Thus, the Form 286B itself is so vague and ambiguous that it would be of little use to the NRC in determining the status of vital area doors.

Gonzales v. United States, 286 F.2d 118 (10th Cir. 1960). There is no evidence that NRC personnel ever examined the Form 286B and certainly none that they did so after the change in reporting requirements. While it is arguably a technical violation of Section 1001 to make a false statement, even if a government employee never sees or hears it, we have found no case in which a prosecution was begun where the false statement had not been communicated to the government agency or where the government was not itself defrauded as a result of the false statement.Indeed, in this situation, as between Ceco and the NRC, knowledge of the alleged false statement was obtained in the first instance by Ceco, which itself informed the NRC of the change in reporting practices. The NRC itself has not indicated any violation of regulations, the Security Plan or implementing procedures as a result in the change in reporting open vital area doors, thereby confirming the lack of materiality of the Form 286B.

III. Due to the pervasive regulation of nuclear power plants by the NRC, enforcement by the NRC is fairer and more effective than the institution of criminal proceedings.

A 1977 memorandum from the Attorney General discussing prosecutorial discretion directed the Department to consider "the possibility of civil, administrative, or other proceedings in lieu of prosecution . . ." in determining whether to initiate criminal action. See Memorandum

of Attorney General Edward H. Levi, dated January 18, 1977, reprinted in The National Law Journal, November 13, 1978, at 14, col. 1. The memorandum pointed out that "In recognition of the fact that resort to the criminal process is not necessarily the only appropriate response . . ., Congress and state legislatures have provided civil and administrative remedies for many types of conduct that may also be subject to criminal sanctions." Id. at 15. This memorandum concluded that, in some cases, such remedies "can be expected to provide an effective substitute for criminal prosecution." Id. at 15.

Several factors indicate that the Department should follow such a course of action here and allow this matter to be resolved through civil administrative action, rather than criminal proceedings. All aspects of the construction and operation of nuclear power plants are regulated by the Nuclear Regulatory Commission. The NRC has a separate division of inspection and enforcement which frequently conducts on-site inspections of nuclear power plants in order to determine whether or not NRC licensees are complying with the Commission's regulations and other requirements, including the licensee's Security Plan. There are 95 full-time inspectors in this Division and the program is currently being augmented by the assignment of resident inspectors to each nuclear power plant. Deviations from regulations

result in citations, requirements for corrective action and may be punished by civil penalties. The NRC is thus in a position to administer a set of sanctions of various degrees of severity that takes account of the total record of the company in compliance with the whole body of that agency's regulations. At Quad-Cities, from 1973 to date, NRC inspectors have spent more than 390 man days to review Ceco's compliance with regulations at the Station. Civil penalties totalling $50,000 have been levied for alleged non-compliances there. Moreover, Ceco has been the subject of specific NRC attention in connection with its overall management of its nuclear power plants. The then director of the NRC's Division of Inspection and Enforcement, Dr. E. Volgineau, both orally and in writing, commented on perceived shortcomings in Ceco's compliance with NRC regulations with top officers of the Company in 1977.

Ceco has responded to NRC citations and Dr. Volgineau's comments in a positive and forthright manner. It has revamped its internal organization and expanded its staff responsible for compliance with NRC regulations. Senior management personnel have become personally involved in compliance activities. It has commissioned an independent analysis of its management of its nuclear program and is implementing changes suggested by that analysis. All of these responses by Ceco have been monitored by the NRC,

which has stated that Ceco's management control is improving significantly. Indeed, in the face of an augmented inspection effort by the NRC, including follow-up of previously identified deficiencies, instances of non-conformance have dramatically declined within the last year. At Quad-Cities, over $4.7 million is being spent just to meet the NRC's most recent industrial security requirements. An open-door alarm system is being installed to further alleviate the vital area door problem.

As a corporation, Ceco is presently subject to the deterrent effect of monetary penalties and the very serious impact of the publicity attendant on them, as well as NRC's other public comments regarding the management of its nuclear program. The response has met the NRC's expectations. The institution of criminal proceedings in this situation would be unfair and counterproductive.

This is a case of first impression. An indictment would be based on a questionable interpretation of regulatory requirements in a factual context where the NRC itself was fully aware of the underlying problem and Ceco's efforts to correct it. Punishment through criminal sanctions would not serve the purposes of the criminal law. It would not add significantly to the deterrent of monetary penalties now administered by the NRC. Since there can be no claim that

Ceco top management is involved in the questioned events, there would be no exemplary purpose served by prosecution.

The NRC enforcement program meets all of the objectives of criminal justice administration in situations such as this by tailoring sanctions to actual conditions and taking into account the whole context of the regulations and requirements. Thus, the NRC enforcement process provides far greater fairness and is far more effective than a criminal prosecution could be. In addition, the NRC enforcement process forces improvements in licensees' performance without the draconian "chilling" effect on the development of a vital energy source, which might occur from a criminal action.

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TO: The Attorney General

SUBJECT:

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TO: (Name, office symbol, room number, building, Agency/Post)	Initials	Date
1. Mr. Frederick Baron		
2. File - NUMEC		
3.		
4.		
5.		

	Action		File		Note and Return
	Approval		For Clearance		Per Conversation
	As Requested		For Correction		Prepare Reply
	Circulate		For Your Information		See Me
	Comment		Investigate		Signature
	Coordination		Justify		

REMARKS

Frederick:

Attached are the questions and answers your requested this morning. I have included one on the NUMEC investigation. Let me know if you need anything more.

DO NOT use this form as a RECORD of approvals, concurrences, disposals, clearances, and similar actions

FROM: (Name, org. symbol, Agency/Post)	Room No.—Bldg.
John L. Martin 8/3/78	Phone No.

5041-102

OPTIONAL FORM 41 (Rev. 7-76)
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Q. There have been repeated allegations that several years ago military-grade uraniun was secretly transferred from the Nuclear Materials and Equipment Corporation (NUMEC) in Apollo, Pennsylvania, to Israel. Are you investigating those allegations and, if so, what is its status?

A. Because that is a matter currently under investigation, I don't believe it would be appropriate to comment. Remember, those allegations go back many years ago and our inquiry has been very difficult because of the passage of time and the unavailability of a number of people who might have knowledge of what was going on at the time. You can be assured, however, that we are doing our best to try to resolve some of the questions raised.

SPECIAL ASSISTANT TO
THE ATTORNEY GENERAL

3/7/78

TO: Frederick Baron

FROM: Mike Kelly

I found this in my files. Do you want it for your NUMEC file?

File - NUMEC

WITHDRAWAL NOTICE

RG: 65 Records of the Federal Bureau of Investigation

Classified Files of the Special Assistant of the AG, Frederick D. Baron, 1977

NND PROJECT NUMBER: 74857 FOIA CASE NUMBER: 37114

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DOCUMENT DATE: 06/15/1976 DOCUMENT TYPE: Report

FROM: FBI

TO:

SUBJECT: Zalman Mordecai Shapiro; Atomic Energy Act; Obstruction of justice

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TABLE OF CONTENTS

NUCLEAR MATERIALS MANAGEMENT
SURVEY NUMBER DNMM-53
NUCLEAR MATERIALS & EQUIPMENT CORP.

1. General

1.1 A survey of control exercised by the Nuclear Materials and Equipment Corporation (NUMEC), Apollo, Pennsylvania, over enriched uranium held by it was performed during the period November 1-12, 1965 by members of the Headquarters Division of Nuclear Materials Management. Personnel from the New York and Oak Ridge Field Offices and from the Space Nuclear Propulsion Office-Cleveland assisted in selected phases of the survey field work.

1.2 The objectives of the survey were:

(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.

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[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 (discharges 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.

1.3 The survey was performed generally in accord with the standards set forth in AECM 7402 for cost-type contractors.[1] A detailed discussion of the survey steps is provided in sections 4 and 5 of this report.

1.4 The survey covered the plant operating period ending October 31, 1965. Many aspects of the survey were extended back to plant start-up in 1957.

1.5 The survey covered all enriched uranium located at NUMEC's Apollo facility; it is all AEC-owned. Enriched uranium located at NUMEC's Park Township facility (see paragraph 2.2) but carried on the records as part of the Apollo facility was also included; plutonium or U-233 at the Park Township site was not included.

2. Description of Apollo Facility

2.1 NUMEC owns and operates a uranium processing facility at Apollo, Pennsylvania. The major emphasis of the facility is on the conversion of UF_6 into uranium oxide or carbides and the fabrication thereof for use in nuclear reactors, including commercial power, research and governmental applications. The Apollo facility is also equipped to and does recover uranium from various scrap and residue materials. NUMEC is not equipped at its Apollo plant to prepare uranium metal but is equipped for most operations involving uranium compounds. Processing and fabrication lines are operated for uranium enriched above 5% U-235 separate and distinct from that below 5% U-235. Also, NUMEC maintains a scrap reprocessing line for uranium of less than 5% enrichment separate from the line for uranium above 5% U-235.

2.2 NUMEC also owns and operates several facilities located in Park Township, approximately 6 miles from the Apollo facility. Normally only the Apollo facility will process uranium, while the Park Township facility will process other materials of interest to the nuclear industry. In addition, drums containing uranium-bearing residues are stored at the Park Township site. The hillside overlooking this site is the location of NUMEC's burial ground. It is this burial ground which is the point of reference for the 1962 and 1963 burial pits discussed subsequently.

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[1] Normally, SNM held by a fixed-price contractor who was financially liable to the AEC for payment for losses would not have been subjected to such an intensive scrutiny; rather the survey would have followed the standards set forth in AEC Immediate Action Directive 7400-8.

3. Summary of Findings

3.1 General

3.11 Based on the survey team's findings, the total cumulative loss[1] (known losses and discards plus material-unaccounted-for) at NUMEC since plant start-up in 1957 has been established as 178 kg U-235. During this period, NUMEC recognized and reported losses year-to-year for a total cumulative quantity of 149 kg U-235. The increase of 29 kg U-235, to 178 kg U-235, was established by the survey team as follows:

	U-235 (Kg)	
Total cumulative U-235 received by NUMEC since plant start-up in 1957.....		14,693
Total cumulative U-235 shipped by NUMEC since plant start-up.....	13,993	
NUMEC U-235 plant inventory as of October 31, 1965.....	522[2]	14,515
Total cumulative quantity of U-235 at October 31, 1965 to be accounted for since plant start-up.....		178[2]

This cumulative loss, while larger (both on an absolute and relative basis) than those reported by other commercial facilities conducting more or less comparable operations, does not appear to be so much larger as to be unexpected, considering the circumstances described

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[1] See footnote (1), paragraph 1.2 for definition of "loss."

[2] There are uncertainties in these quantities due to a large number of heterogeneous uranium-bearing residues on inventory which are not amenable to representative sampling. Therefore, upon recovery by NUMEC, some adjustment, either upward or downward, to the inventory may be necessary. If such an adjustment is made, a compensating adjustment to the cumulative loss of 178 kg U-235 likewise will be necessary. (Also, see para. 3.17.)

subsequently in this report. While it cannot be stated with certainty that diversion did not take place, the survey team found no evidence to support that possibility. Conversely, there were a number of observations by the survey team and others, of NUMEC's practices that would reduce the possibility of diversion. Enriched uranium, except that in process, is stored at the Apollo plant in secured areas under lock and key, and is the responsibility of a vault custodian. Access into and from the plant is through a small waiting room which is monitored by a receptionist or a guard. All visitors are required to sign a register upon entering or leaving the plant. Of particular note is the fact that there have been no instances of reported missing identifiable items such as cylinders of UF_6 or containers of uranium products awaiting shipment or other uranium compounds. Since July 1965, until September 1965, AEC inspectors were in the plant to observe NUMEC's scrap uranium reprocessing operation. From November 20, 1965 until February 23, 1966, Oak Ridge Operations Office has had an inspector observing this operation on a selective work shift basis. Also, during the exhumation of the burial pits, personnel from the Division of Compliance, Division of Industrial Participation, Division of Nuclear Materials Management, and SNPO-C witnessed the recovery. Thus, ample opportunity was afforded AEC personnel for contact and discussion with all levels of NUMEC operating and supervisory employees. None of these varied and lengthy associations revealed any evidence that would lend support to the possibility of diversion of special nuclear material at NUMEC.

3.12 The AEC survey team developed an estimate of 84.2 kg U-235 resulting from known loss mechanisms. When offset against the total cumulative loss of 178 kg U-235 (paragraph 3.11), this results in a cumulative material-unaccounted-for quantity of 93.8 kg U-235 (178 kg - 84.2 kg). Based on total U-235 introduced into NUMEC, the total loss of 178 kg is 1.21% of plant receipts and the unaccounted for of 93.8 kg is 0.64%.

3.13 The estimates of all known loss mechanisms are tabulated as follows and are discussed below:

	U-235 (Kg)
Accidental losses[1]	3.0
Normal operational losses:	
(a) Liquid waste effluent discards[2]	58.0
(b) Burial pit discards (non-recoverable contaminated earth burden)[3]	2.2
(c) Stack gas losses[4]	14.0
(d) Liquid waste in storage drums[5]	2.0
	79.2
(e) Trackout, contaminated laundry and shoe covers[6]	5.0
Total - Known Loss Mechanisms	84.2

3.14 Through an examination of available NUMEC records supporting stack gas losses (14.0 kg), liquid wastes in storage drums (2.0 kg), and liquid waste effluents (58.0 kg), the survey team developed an estimate of about 74 kgs U-235 for the entire operational period of the Apollo facility. Additionally, NUMEC records indicate a loss of about 3 kg U-235 resulting from a vault fire which occurred February 9, 1963. NUMEC's records of the sampling and analysis of the uranium-contaminated earth burden associated with the recovery operation of the 1963 burial pit show in excess of 2.2 kg U-235 which is uneconomical to recover. NUMEC's recovery of 20% of the uranium-bearing recoverable material exhumed from that pit yielded a quantity of

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(1) See para. 3.14

(2) See paras. 5.11-5.13

(3) See para. 5.25

(4) See para. 5.31

(5) See para. 5.32

(6) See para. 5.33

about 1.1 kg U-235. An extrapolation of this recovery experience to the remaining 80% of the pit material on which incineration and recovery is progressing should account for an additional 4.4 kg U-235, resulting in a total of 5.5 kg U-235. However, the 5.5 kg U-235 exhumed from the 1963 pit has now been brought back on to the physical inventory, so it is not to be considered in evaluating known discards or loss mechanisms. Thus, from NUMEC's records, it is possible to support known losses of 79.2 kg U-235.

3.15 NUMEC has developed no historical data which would enable the survey team to place an estimate on the amount of uranium losses from such sources as contaminated laundry, shoe covers, and trackout. However, based on Union Carbide's Y-12 Plant experience factors for such loss, the survey team has estimated NUMEC's losses from this source as 5 kg U-235. Thus, it is possible to place what the survey team believes to be a conservative total estimate of about 84.2 kg U-235 (79.2 kg + 5.0 kg) which NUMEC could have assigned to known discards or loss mechanisms.

3.16 The possibility of the "loss" of uranium resulting from a bias in measurements of shipments of UC_2 from NUMEC to WANL was investigated. No evidence was found to suggest that such a bias existed. The details of that investigation are attached as Appendix A.

3.17 NUMEC has a sizeable backlog of internally generated uranium residues. The U-235 content assigned to these residues by NUMEC was recognized by the survey team as being highly imprecise and is subject to adjustment upon recovery. Nevertheless, such content was, and is, the best data available and was used by the AEC survey team in computing inventory quantities. Many of these residues have lost contract identity. Essentially all of these residues which have lost contract identity have been assigned by NUMEC to the WANL Purchase Order 59-NP-12674.

3.2 Records Audit

The audit of the NUMEC records confirms the findings of prior surveys that the records which purport to control internal movements of material were incomplete and inadequate. Because of this it is impossible to identify with any high degree of accuracy the true physical losses attributable to any given

contract. In addition, the plant-wide material records were based largely on book values of inventory and generally were adjusted for losses only at the time of closing a contract. This adjustment was usually only in the amount of loss which had been estimated on an engineering basis at the time the contract bid was made.

3.3 Nuclear Materials Management

The function of nuclear materials management at NUMEC is in need of direct management attention. Until recently, NUMEC management had not assigned the caliber of full-time professional talent generally found by other companies to be necessary in such a complex operation. In addition, direct supervisory attention to this matter in plant operations, coupled with an educational program to stress the importance of proper material control to all plant employees should be a matter of first priority.

4. Discussion

4.1 Records and Reports

4.11 The central (plant-wide) accountability records employed by NUMEC to generate material balance reports for contract material and semi-annual status reports for leased material consist of an external receipts and removals transfer journal and a job order ledger for each report. The job order ledgers contain, by NUMEC internal job number, SS material balance summaries for job orders which are in process. Only external receipts and removals are posted to the job order ledger, and, in the main, losses are shown only when contracts are closed, and then only in the amount of the estimates included in the bid.

4.12 In addition to the records maintained in the central accountability office, a combined contract and lease subsidiary interplant transfer ledger has recently been established and is being maintained by the vault custodian in the uranium processing area. (This ledger was established subsequent to the April 30, 1965 survey.) This book of record reflects, by job order, movement of material through the different processing areas of the facility, However, adjustments had not been made for

significant differences between the book inventories and periodic physical inventories which had been requested by supervision on an individual job order. As with prior job ledgers, job order balances still do not reflect either the quantities physically on hand or losses localized by job order or by process. A quantity measurement is made as material is received and removed from a process, but any material lost due to processing is not recorded.

4.2 Physical Inventory

4.21 The survey team prepared an independent inventory listing of all enriched uranium recognized by NUMEC as being physically present, using NUMEC's data for uranium and U-235 content. Most of the listing was completed on November 2-3, 1965; a few items about to be fed to the processing line were inventoried on November 1 in order to minimize the impact of the inventory listing on production. The inventory list consisted of about 2300 line items. Of these, 77% constituted only 12% of the total U-235 inventory. This relationship demonstrates that many items on the NUMEC inventory consist of low-grade and low-enrichment residues.

4.22 Specially prepared inventory forms were used to facilitate subsequent processing of the inventory by EDP equipment. The approximately 2300 line items of inventory were sorted by NUMEC-assigned job number, and were printed and totaled, using EDP equipment at AEC's data processing center, Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tennessee.

4.23 In order to test the validity of the inventory data, the survey team check-weighed a statistical sample of 146 items, selected at random. Thirty-four of the items weighed were also sampled for independent chemical and isotopic analysis at AEC's New Brunswick Laboratory, New Brunswick, New Jersey. Of the 146 items that were weighed, six discrepancies which could not be explained by evaporation or other recognized causes were noted. This was considered acceptable on the basis that the statistical sampling plan used (MIL-STD-105D) permitted as many as twelve such errors.

4.24 For those items selected for independent analysis, the criterion of acceptability was considered to be total uranium and U-235 in the batch. Collectively, the total uranium and U-235 values agree favorably, although a large number of individual differences were considered excessive. This was not unexpected, due to the heterogeneous nature of the sampled materials, that is, miscellaneous residues, sludges, ash, and recoverable wastes. In most of these cases, only a small amount of uranium or U-235 was involved and the value placed on the SNM by NUMEC was done by a quick gamma counting technique. However, the survey team selected samples of these materials for independent analysis to avoid the possibility of any significant quantity of U-235 escaping detection.

4.25 NUMEC had stored 731 air filters (704 of which were not on inventory), from process hoods and glove boxes; 177 containers of combustible and other wastes accumulated since 1964 (not yet incinerated or leached) and of combustible wastes removed from the 1963 burial pit; and 118 process air filters still in use in the process lines. Each of these inventory categories is discussed below.

4.26 The survey team estimated the U-235 content in the 731 air filters, using a gamma counting technique in which the 184 kev natural decay gamma ray from U-235 is selectively counted under conditions of controlled geometry. A comparison of counting data from the unknown filters with that from two prepared standards, indicated that the 731 air filters contain approximately 6.5 kg U-235. In some instances, however, this estimate is based on assumptions concerning comparability of geometry which are not based on experimental evidence. Recovery of 22 selected filters for checking purposes was performed by the Union Carbide Nuclear Corporation's Y-12 Plant. Comparison of Y-12's recovery data with that obtained by use of a gamma spectrometer was excellent on the basis of total uranium 235 content. While agreement on individual filters was not always within the 10% expected, this was not unexpected because many of the filters contained very small quantities of uranium ($\ll$10 grams uranium 235), and the use of the gamma spectrometer under field conditions will not result in agreement of 5-10% which is possible in laboratory testing when background counts can be minimized, more positions of the filter are counted, and longer counting times can conveniently be used.

4.27 The survey team also estimated the U-235 content of the 177 assorted containers of combustible waste and carbon wool to be 1.5 kg U-235, using the same technique as that used for the air filters. Recovery of three selected boxes for checking purposes was performed by the Y-12 Plant, and showed a wide variation in agreement with the survey team's gamma spectrometer measurements. The survey team believes that this disagreement results from the lack of standards and the variable and uncertain counting geometry of the boxes. However, because these wastes contain such a small amount of U-235, even a large variation in the estimate has little or no effect on the total inventory.

4.28 On the basis of engineering drawings, and a physical examination of the plant, the survey team estimates that 118 air filters currently in use were not included in the physical inventory listing. NUMEC has a scheduled program for removal of in-line air filters based on weight gain and length of time in service. On the assumption that, on the average, each air filter still installed in the plant process lines was 50% loaded, they were estimated to contain 540 grams U-235.

4.29 NUMEC has exhumed both its 1962 and its 1963 burial pits, and has hand-sorted potentially recoverable material. The combustible wastes from the 1962 pit had been ashed and analyzed prior to the survey, and were included in the physical inventory with a U-235 content of 300 grams. Of the material removed from the 1963 pit, the survey team estimated that approximately 5.5 kg U-235 is contained in such wastes.

4.3 Inventory Summation

The NUMEC inventory of 522 kg U-235 (as of 10/31/65) was derived by the AEC survey team on the basis of inventory quantities which almost entirely (99%) had been established by NUMEC. A quantity of 5.2 kg U-235 was independently determined by the AEC survey team by gamma spectrometry of stored filters and combustibles assigned to the Westinghouse Astronuclear Purchase Order 59-NP-12674 (WANL-1231). The following tabulation shows the material assigned to the WANL-1231 contract and to all other contracts. The survey team recognizes the large uncertainty associated with the inventory quantities assigned to the residues, ashes, etc., from the WANL-1231 contract because of their heterogeneity and low U-235 content.

PHYSICAL INVENTORY OCTOBER 31, 1965

	U-235 (Kg)		
	AEC Quantities	NUMEC Quantities	Total
Leased Material - SNM-145	---	97.0	97.0
Non-Leased Material			
Contract WANL P/O 59-NP-12674			
Residue from original job order	---	2.7	2.7
Combustibles	0.3(1)	12.0	12.3
704 Filters	4.9(1)	---	4.9
Filter Ash	---	6.0	6.0
Material from Burial Pit	---	5.8(2)	5.8
Residues from Fire	---	0.7	0.7
Total WANL P/O 59-NP-12674	5.2	27.2	32.4
All Other Contracts	---	391.8(3)	391.8
Total	5.2	516.0	521.2
Rounding Difference			0.8
Total Rounded AEC/NUMEC 10/31/65 Inventory			522.0

(1) Determined by AEC gamma spectrometry.

(2) The AEC reviewed the NUMEC data supporting the quantities of U-235 in combustible waste removed from the 1963 burial pit and accepted NUMEC's estimated quantities.

(3) NUMEC carried on inventory 27 filters with a U-235 content of 3.2 kgs which the AEC accepted notwithstanding that the AEC's gamma spectrometry test indicated that these filters contained 1.7 kg U-235.

4.4 Foreign Transfers

The survey team was aware of the twenty-eight foreign contracts under which NUMEC had performed fabrication services and had transferred enriched uranium. Documents covering these transfers have been reviewed routinely by the Oak Ridge Field Office and by the Division of International Affairs to ascertain that the documents reflect the quantities said to have been shipped and received and that the documents have been appropriately signed. The quantities in specific shipments, domestic as well as foreign, are not confirmed independently by the AEC; such actions have been outside the scope of the present AEC system of control of nuclear material. Instead, reliance has been placed on a technical review of the shipper's internal controls and independently developed receiver's data. The validity of this approach is, of course, largely dependent upon the integrity of the shipper and receiver. A review of NUMEC's shipping practices and procedures, made by representatives of the Division of Nuclear Materials Management, International Affairs, and Office of the Controller is the subject of another report. That report indicated that NUMEC has sufficient internal controls on shipments which, when properly implemented, should, in the absence of a deliberate collusion, ensure that the quantities reported on the transfer documents were indeed those quantities shipped. The Division of Nuclear Materials Management is presently studying the possible feasibility and desirability of independent AEC physical checks of shipments at time of shipment. A summary of the foreign transfers made by NUMEC is attached as Appendix B.

5. Losses, Discards, and Material Unaccounted For

5.1 Liquid Wastes

5.11 During the course of normal processing operations NUMEC discards several thousand gallons of liquid waste per 24 hour period, at a typical uranium concentration of somewhat less than 1 ppm. The survey team reviewed the system used for the collection and measurement of liquid wastes, and examined the log books used for the recording of data. NUMEC was asked to convert the log book data into grams U-235, and to prepare monthly totals. This summation was then subjected to audit testing.

5.12 The survey team adopted a specific activity value of 88 dpm/µg, based on an assumed average enrichment of 5-20% U-235 in calculating the content of the liquid effluent discarded. Thus, it has been estimated that during the period from July 1960 to September 1965, NUMEC

discarded an estimated 54 kg U-235 in liquid wastes. Extrapolation of this data to the start of plant operations results in an additional 4 kg U-235 discarded for a total of 58 kg U-235.

5.13 The survey team noted that samples of liquid waste effluent consistently have a pH of 9-11, and usually are cloudy. Samples are taken at a point approximately 10-20% of the vertical height from the true tank bottom. These factors led the survey team to surmise that actual liquid waste concentrations may even be somewhat greater than calculated.

5.2 Burial of Contaminated Waste

5.21 In each of the years 1961, 1962, and 1963, NUMEC made burials of contaminated wastes which they believed contained insignificant amounts of uranium. In 1964, however, when NUMEC recognized that unacceptably high uranium losses were occurring, NUMEC came to the conclusion that previous estimates of uranium in combustible wastes being buried were low, and no further burials have been made subsequent to that time. The 1962 and 1963 pits were exhumed in the fall of 1965. The exhumation operation was witnessed by AEC personnel representing the Office of Compliance, the Division of Nuclear Materials Management, the Division of Industrial Participation, and SNPO-C. The results of this reopening are described below.

5.22 The 1962 and 1963 burial pits were reopened by first using a bulldozer to push off the overburden, and then using a "clamshell" type digger to remove all buried wastes. These wastes were then hand sorted to remove all combustible material. Any other material which appeared to be recoverable was also removed for separate processing.

5.23 The survey team was advised that 300 grams U-235, were recovered from the 1962 pit. Incinerated ashes from the 1962 pit, as well as from current operations, were included in the physical inventory.

5.24 Incineration of combustible wastes from the 1963 pit began during October, 1965, and was approximately one-fifth complete as of November 11. The survey team estimates that 5.5 kg U-235 will be recovered.

5.25 Soil samples from the 1963 burial pit indicate a U-235 concentration of about 2 ppm to a depth of about 10" below the pit bottom. The most probable explanation for this contamination is that it represents uranium leached or washed from buried contaminated equipment. The survey team accordingly estimates that the total contaminated volume is 46" thick (36" in the pit, plus 10" below the pit bottom). Since the pit area is approximately 5540 sq. ft. the estimated U-235 content is 2.2 kg.

5.26 Since very little uranium was found in the 1962 pit, the survey team did not extrapolate the contaminated soil data to include soil removed from the 1962 pit.

5.3 Miscellaneous Discards

5.31 The NUMEC Apollo plant currently contains 118 filtered exhaust stacks and three large ventilation fans. Using an average of 110 $d/m/M^3$, the survey team estimates that at least 14 kg U-235 have been lost through this mechanism. The 14 kg estimate is considered to be a minimum because Division of Compliance inspectors have noted that stack gas surveys were not performed on stacks at times when loss rates might be expected to be abnormally high. There does not appear to be any way to estimate the extent (if any) to which the estimated 110 $d/m/M^3$ average loss rate may be lower than actual.

5.32 NUMEC has stored some 1500 drums of waste which, because it contains beryllium, cannot be discarded. Based on samples taken during the survey, these wastes are estimated to contain 2.0 kg U-235.

5.33 The survey team notes that coveralls, lab coats, and rubber shoe covers are cleaned by Nuclear Decontamination Corp., a NUMEC subsidiary, and that no U-235 recovery data is available. The Apollo plant employs about 225 people, of whom perhaps 100 routinely wear coveralls. In addition, shoe covers are used at a rate of 30-50 pair per day. Neglecting the period prior to 1960, when operations were on a smaller scale, these use rates still total about 150,000 coveralls and 80-100,000 pairs of shoe covers. No truly comparable AEC operation exists, but Union Carbide's Y-12 Plant has derived an experience factor of 0.2 g U per working day per employee as loss through trackout, laundry service and sanitary sewers. On this basis, and assuming an average enrichment of 7% U-235, the survey team estimated about 5 kg U-235 lost through this mechanism.

5.4 Material Unaccounted For

Of the total cumulative "loss" of 178 kg U-235, 84.2 kg has been accounted for as discussed above. The remainder, 93.8 kg U-235, is material-unaccounted-for. As defined previously, material-unaccounted-for (MUF) is that quantity remaining when the difference between the physical measurements and book records has been adjusted for all quantities which are capable of measurement, directly or indirectly (accidental losses, normal operational losses -- discharges to tanks, sewers, stacks, burial grounds, etc., and any other known write-offs of material). MUF, then, is the result of measurement uncertainties, unrecognized process losses, bookkeeping errors, diversions or thefts and possibly even other causes. If the uncertainties of input, output and inventory measurements, which result from the use of biased and/or imprecise methods, are large, then it follows that their contribution to the MUF will be large. Likewise, if unrecognized process losses, such as general building contamination, equipment hold-up, clothing absorption, track-out, and air venting, occur individually in very small quantities they may over a long period, accrue into a large contribution to MUF. In the particular case of waste stream effluents at NUMEC, the definite possibility exists that the actual level of discard may be as much as 15 kg U-235 greater than that estimated by the survey team because of the less than optimum sampling conditions under which NUMEC has operated. Thus, what may have been an explainable discard of 15 additional kg U-235 is now included as part of the MUF.

6. Westinghouse Astronuclear Purchase Order 59-NF-12674

6.1 Resolution of Disposition of Material Losses

6.11 This order involved the chemical conversion of 1013 kg U-235 as UF_6 (at 93+% enrichment), furnished by the customer to produce UC_2, of which 713 kg U-235 as UC_2 (at 93+% enrichment) was delivered as acceptable product. A physical inventory performed by OR for the period ended April 30, 1968, disclosed an apparent loss of some 53 kg of U-235 on the WANL contract. While recognizing the stated position of NUMEC that on a production scale this process was of an untried and unique nature, nevertheless the survey team found insufficient technically-based records to account for a loss of the magnitude of 53 kg U-235. As a result

of this survey, the loss ascribed to the WANL contract is now believed to be about 61 kg U-235. This increase is net, after adjusting for additions to inventory from previously unrecognized sources and for reductions to inventory resulting principally from a more accurate estimate of the U-235 content of air filters. It should be noted that NUMEC had recognized and reported losses of 38 kg U-235 chargeable to the WANL contract.

6.12 NUMEC, by letter of December 29, 1965 to the Division of Nuclear Materials Management (Appendix C), set forth its position that "high losses perhaps up to 30 kg of U-235 (or 3%) may have been experienced in this unique and complex operation." NUMEC claims losses of this magnitude have been experienced on jobs involving the same number of processing operations, but on material inherently less dusty in nature. While a loss of this order may be reasonable to assume, the survey team pointed out that some portion of this "loss" should be of a measurable nature, i.e., entrapped in air filters, on glove box walls, in waste solutions, combustible wastes, etc., and as such could subsequently be brought on to the physical inventory, or recorded as a known discard.

6.13 In an attempt to establish yields and loss mechanisms directly applicable to this purchase order, the survey team requested NUMEC production control and process engineering data on this and other contracts. The data made available was of little or no value in this regard. Process lots or batches could not be correlated to points in time nor could a sequence of processing events be established. All efforts in this direction were negated when it was learned that many of the requested records had been inadvertently destroyed by supervisory personnel during a "clean up" campaign at the time of an employee strike, January 1 to February 25, 1964.

6.14 The survey team then reviewed NUMEC's operating practices in regard to segregating or mingling of material assigned to the various contracts held by NUMEC. If it could be established that material assigned to the WANL purchase order had been transferred to other contracts without a record of credit to the WANL account, such transfer would appear as a "loss" on the WANL account. This approach has uncovered the likelihood of such transfers having indeed occurred. The referenced NUMEC correspondence to the Division of Nuclear Materials Management discusses these possibilities in some detail. These, and other

postulated practices whereby WANL material could have become mixed with material from other contracts are discussed below.

(a) In a letter of July 8, 1963 from NUMEC to WANL, NUMEC substantiates the possibility that material from the WANL contract may have been mixed with other material. Of 24.5 kg U-235 as UO_2 which because of slight isotopic degradation was unacceptable to WANL, only 19.8 kg U-235 is shown as having been returned to AEC for credit to the WANL contract. NUMEC suggests the possibility that, in the course of scrap recovery, 4.7 kg U-235 from the WANL contract may have been returned to the AEC under other contracts.

(b) By memo of October 5, 1963 from C. Beltram, NUMEC, to F. Forscher, NUMEC, an incident involving the degradation of 2.5 kg U-235 of WANL material is described. No evidence is available that this material was returned as a credit to the WANL job. NUMEC suggests that it can be reasonably inferred that this material was recovered with other scrap material and not credited as WANL material.

(c) The manner in which NUMEC has conducted its scrap recovery operation has an important bearing in evaluating the possibility of NUMEC's allocating material from Westinghouse Astronuclear Purchase Order 59-NP-12674 (referred to as Contract 1231) to other scrap recovery contracts. This is best explained in NUMEC's referenced letter to the Division of Nuclear Materials Management (Appendix C), and the pertinent section is quoted as follows:

> "The Nature of NUMEC's Scrap Recovery Operations
>
> "The possibility for the allocation of materials generated in the recovery of scrap to contracts other than 1231 is quite great in view of the manner in which NUMEC's scrap recovery operation was conducted.
>
> "A scrap recovery facility, in a company handling a large number of special nuclear materials contracts each year, cannot be reserved for an extended period of time to

"recover all of the scrap that may be generated under a contract which may require a year or more to complete and which, from time to time, may generate quantities of scrap material. Of necessity, the scrap from a long-term contract must be scheduled for recovery intermittently with scrap material from other contracts. Such was the case with respect to the 1231 scrap material.

"A major clean-up between jobs would be required in order to insure against the downgrading of material in an intermittent operation of this type. Such a clean-up itself, however, will generate additional losses since material is bound to be lost in the huge amounts of solution required to adequately clean the complex equipment in the plant.

"Moreover, since the scrap recovery operation involves a solvent extraction process, one must reach near saturation equilibrium in the plant before extracted material is chemically clean. Thus, the first material removed from the process must always be recycled to achieve clean material. Correspondingly, the material last removed from the process is, as a general matter, never pure enough to be used in end product and, therefore, again becomes scrap.

"The foregoing suggests the economic infeasibility, if not the practical impossibility of totally segregating each job in a plant with a view toward 'finishing' each job before moving to the next. To offset these consequences, it was NUMEC's practice to segregate material by contract only through the point of dissolution, at which point the accountability under a given contract was established. Thereafter, our scrap recovery equipment was operated on a 'heel to toe' basis without segregation of material between jobs. Thus, if scrap from ten jobs, for example, was processed in one recovery campaign, certain assumptions had to be made in assigning the recovered material between the originating contracts. This assignment was made on a basis proportionate to each contract's feed contribution.

"Losses were calculated in the manner described below. We believe that this method of scrap recovery operation is generally consistent with industry practice.

"Disposition of 1231 Material (1962-63)

"With this information as background, it becomes pertinent to examine the scrap recovery contracts most likely processed at NUMEC during the same time the 1231 contract was active. Table I, attached, lists these contracts. We believe these jobs were run on a 'heel to toe' basis in conjunction with the recycle and/or scrap material from Contract 1231. Excluded, however, are those contracts involving the processing of uranium of less than 5% enrichment. Since NUMEC maintained a separate reprocessing facility for material less than 5% enriched, it is unlikely that such material would have been run on a 'heel to toe' basis with highly enriched material.

"The total quantity of uranium represented by the contracts in Table I is approximately 470 kilograms of U-235. These jobs were closed out with an average overall U-235 loss of approximately 1.5 per cent, or 7 kilograms. The average 1.5 per cent loss figure was selected on the basis of our best estimate, at the time, of the losses experienced in our recovery operation. A definite figure could not be established since, in the 'heel to toe' process, described above, there was no complete clean-up between reprocessing campaigns. It is important to note, at this point, that due to the complexity and quantity of the scrap on hand during 1962-1963, there was a large uncertainty with respect to total plant accountability during this period. As a result there was no clear evidence, at the time, to indicate that the 1.5 per cent figure was inaccurate.

"It was only within the last year, during which NUMEC performed two large scrap contracts of 108 kilograms [AT(40-1)3309] and 137 kilograms [AT(40-1)3379] that it became evident that the

"losses were greater than those initially anticipated. In both cases, a closed accountability was maintained; that is, there was no 'cross-over' between jobs. In the first case, losses were 4.1 per cent; in the second, 3.0 per cent. (The second contract is approximate because final accountability has not been established.) In both cases the scrap involved was similar in nature to that processed during 1962-1963 and, accordingly, utilized nearly the same process chemistry and equipment. On the basis of our current experience, it would appear that a loss factor of 3.5 per cent may have been more appropriate than one per cent. On this basis, the losses experienced under the scrap recovery contracts itemized in Table I could have been 16.5 kilograms instead of the 7 kilograms declared. This would suggest that approximately 9 kilograms of 1231 contract U-235 could have been inadvertently mixed and returned with material under these scrap recovery contracts."

6.15 NUMEC has further indicated that as a result of underestimating its reprocessing losses on other purchase orders closed out before and during the WANL contract, as much as 12 kg U-235 more of WANL material may have been returned to the AEC on other purchase orders. Thus, after a close-out of all inactive NUMEC contracts, only the WANL contract remained as the identifiable point for all other prior misassigned losses and therefore became the final repository for those losses.

6.16 In the survey team's judgment, there is a high degree of probability that WANL contract material was transferred to other contracts in the manner described above. The survey team's review and observation of NUMEC's operations and the findings of other surveys of the NUMEC operation since plant start-up in 1957 contribute in a large part to this judgment.

7. Recommendations

7.1 To prevent a recurrence of the circumstances which resulted in this survey; to put NUMEC in a position to recognize and to minimize its losses; and, to record and report to the AEC in a timely manner losses and material-unaccounted-for actually being experienced, it is recommended that NUMEC:

1. Give added recognition to its nuclear materials management responsibility by establishing at an appropriate high-level adequate staff to deal with materials management with full support from company management.

2. Take immediate action to:

   a. Install a general ledger to summarize accounts periodically and to support data reported in material balance reports to the AEC.

   b. Develop a subsidiary ledger to account physically for SS material by material balance area and by NUMEC job order number.

   c. Create a chart of accounts (job order numbers) referenced to the project, contract, and purchase order numbers. (The account number itself should identify that the SS material associated with the account is either AEC-contract material or leased material.)

   d. Establish a system of inventory identification such as by pre-numbering process containers or other comparable technique. These numbers could then be entered on internal transfer forms and posted to records maintained for the different material balance areas.

   e. Establish an internal transfer system so that internal transfers to and from material balance areas and from one account (job order) to another within the same material balance area are documented with transfer forms and recorded in the subsidiary ledger.

   f. Issue periodically, by material balance areas, a report to NUMEC management of ending inventory and losses which shows and explains losses by job order and the quantity and forms of material physically on hand by job number.

3. Identify and establish the magnitude of all significant loss mechanisms and technical bases thereof. Translate such data to U and U-235 content and record and report on a current basis.

4. Establish inventory procedures and perform plant-wide inventories periodically, but not less often than annually. After comparison of these inventory quantities with the book quantities, record the resulting gain or loss. In establishing plant inventory procedures, NUMEC should not ignore the need to obtain an adequate inventory of in-process material.

5. Establish all control procedures in a procedure manual and submit same to the Oak Ridge field office for review and approval.

6. Process the large quantity of accumulated residues, combustibles, filters, ash, etc., and return the SNM recovered to the AEC. In so doing, care must be exercised to identify and to process residues in such a manner as to permit comparison of recovered values with book values. After such comparison, the resulting gain or loss should be recorded.

7. Adjust the NUMEC October 31, 1965 book inventory to agree with the AEC's October 31, 1965 physical inventory which establishes a U-235 content of 521,179 grams. In making this recommendation, the survey team recognizes that there are uncertainties in this quantity due to the large number of heterogeneous uranium-bearing residues on inventory which were not amenable to representative sampling. Therefore, upon recovery, some adjustment, either upward or downward, to the inventory may be necessary from time to time. (A detailed tabulation of the physical inventory has been provided to NUMEC.)

8. Initiate a company-wide educational program stressing the high intrinsic and strategic value of special nuclear material and re-emphasize the health and safety implications of careful handling practices.

8. Meeting with NUMEC

8.1 On February 3, 1966, the AEC senior survey team personnel met with NUMEC management to discuss the findings of the survey and the recommendations that were being made. That meeting is summarized in a memorandum to the files attached as Appendix D. A NUMEC letter dated February 5, 1966 setting forth their comments and actions is attached as Appendix E.

April 6, 1966
Date

S. C. T. McDowell
Assistant Director for Control
Division of Nuclear Materials Management

APPENDIX A

INVESTIGATION OF THE POSSIBILITY OF BIASED MEASUREMENTS IN SHIPMENTS OF UC_2 FROM NUMEC TO WANL

DRAFT

We investigated the possibility that measurements of carbon coated UC_2 prepared and delivered by NUMEC to WANL for NERVA fuel elements might be biased. Conclusions are summarized below, and are discussed in greater detail in the attachment.

No evidence was found to suggest that such a bias existed. On the contrary:

a. both facilities used well-maintained weight balances of good sensitivity;

b. both laboratories used published analytical procedures, standardized against National Bureau of Standards certified uranium chemical and isotopic standards; and

c. WANL used a standard riffle sampling technique designed to produce representative samples. NUMEC used a grab sampling technique which might be expected to yield samples biased high, but the excellent agreement between NUMEC and WANL analyses indicates that the grab samples probably were representative.

The analytical procedures used by both NUMEC and WANL were specifically developed for the routine analysis of uranium carbides. They have been adopted, with occasional minor modifications, by several laboratories* that routinely analyze such materials. A conservative limit of no more than 0.5% should be assumed as the maximum bias which could have gone undetected. More precise analytical methods are available which are believed to have a maximum undetected bias of less than 0.1%, but their cost precludes their routine use for most purposes.

Both NUMEC and WANL independently weighed, sampled, and analyzed product shipments, and this data was investigated for evidence of possible bias between the two laboratories. In summary, this showed that:

a. net weights agreed to within $\pm$ 1 gram in all but two of eighty-two shipments, and to within $\pm$ 4 grams in all cases. (Most shipments contained about 9500 grams of product.)

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*Nuclear Fuel Services, Minnesota Mining & Manufacturing Company, Nuclear Materials and Equipment Corporation, Westinghouse Astro Nuclear Laboratory, and Atomics International.

DRAFT

b. uranium content agreed to within 50 grams on all but fourteen shipments and to within 100 grams on all but nine shipments. The largest single difference was 258 grams U. These were more or less randomly dispersed in time, however, and were equally divided between WANL high and WANL low. The net total difference in uranium content between the two laboratories is 15 grams (WANL high), or only 0.002%. A graph of these differences is attached.

c. For all practical purposes, U-235 content agreed unless there was a difference in uranium content. The net total difference between the two laboratories is 37 grams (WANL low) or 0.005%.

Attachments:
Details of Investigation
A Graph of S-R Differences
Method 1.101, "Gravimetric-Volumetric Determination of Uranium in Oxide-Organic Dispersions"

APPENDIX A - Attachment 1

DETAILS OF THE INVESTIGATION

DRAFT

NUMEC PROCEDURES

NUMEC weighed their product on a Sauter direct reading scale with a sensitivity of one gram. The balance is checked with standard weights by the NUMEC quality control staff about every two weeks. This balance has been reviewed by a member of my staff, and is considered fully adequate.

NUMEC took grab samples from each batch for uranium analysis. This could possibly lead to a sample richer in uranium than the parent batch.* On a series of seventy-five batches, however, the average NUMEC analysis was 0.6657 g U/g sample, while the average WANL analysis (on their own samples) was 0.6643 g U/g sample. These two averages are not statistically different, but even if it is assumed that the difference is due to biased NUMEC samples, the magnitude of the bias is only 0.2%.

NUMEC used analytical method 1.101 published in TID-7029, "Selected Measurement Methods for Plutonium and Uranium in the Nuclear Fuel Cycle," with the modifications discussed below. The method is believed to be capable of a precision of 0.4% relative, under conditions of routine use. (Procedure 1.101 is reprinted as Attachment 3.)

Some laboratories have experienced difficulty in avoiding loss of sample due to "popping" during the ignition step (during which the carbon oxidizes in CO_2 and the uranium converts to U_3O_8). To preclude this, NUMEC placed their samples on a bed of Al_2O_3 which had previously been ignited to constant weight. This should be an effective means of avoiding loss of sample.

Procedure 1.101 suggests that the addition of filtered oxygen to the ignition furnace will speed the analysis. NUMEC adds about 200 ml of filtered oxygen per minute.

*Qualitatively, the thickness of the carbon coating on a particle is constant, regardless of particle size. This means that the average uranium concentration is greater in large particles than in small ones. Like all mixtures of particles (sand, for example) the finer particles tend to settle to the bottom. Thus, a grab sample from the top of a container may be rich in large particles, and correspondingly rich in uranium.

NUMEC used method 2.401 (also in TID-7029) to verify that isotopic degradation had not occurred. Since this method is less accurate than the mass spectrometric technique used by Goodyear Atomic Corporation (AEC's Gaseous Diffusion Plant near Portsmouth, Ohio) to analyze UF_6 delivered to NUMEC, the Goodyear data was used as a basis for product shipments.

WANL PROCEDURES

Scales and balances used by WANL have been reviewed by NMM survey teams, as part of required annual surveys. Since there was no basis for suspecting a bias in net weights, no additional review was made for this investigation.

WANL used a riffle sampling technique in which the batch is progressively split into two approximately equal portions until the desired sample size is reached. This is a standard sampling technique for materials of this type; there is no basis for suspecting that the samples thus obtained are not representative of the parent batch.

WANL also used method 1.101 from TID-7029. In fact the WAPD laboratory at Waltz Mill, Pennsylvania, which performed the analyses for WANL, was responsible for developing method 1.101 and for estimating its precision at 0.4% relative. WANL does not use the aluminum oxide bed, but does follow the recommendations in method 1.101 that ignition begin at 250° C, and that final ignition at 900° C be carried out overnight. Under these conditions of slow heating there should be no sample "popping."

WANL used methods 2.401 and 2.406 to determine U-235 content. In combination these two methods are more accurate than the single method used by NUMEC, but still not as accurate as the mass spectrometric analyses. This undoubtedly accounts for the small differences noted.

ADDITIONAL COMMENTS

Both laboratories have confirmed their procedures using NBS certified chemical and isotopic standards. The NBS chemical standard is certified to ± 0.02%, including a conservative allowance for uncertainties in the stoichiometry of U_3O_8. The isotopic standards in the range of 93% U-235 are certified to ± 0.05%.

WANL and NUMEC have not engaged in any formal sample exchanges. However, WANL has exchanged samples of similar material with AEC's New Brunswick Laboratory (NBL), Union Carbide Corp. (Y-12), the Los Alamos Scientific Laboratory (LASL), and Nuclear Fuel Services, Erwin, Tennessee (NFS).

Average values obtained are as follows:

WANL	0.6985 g U/g sample
NBL	0.6979 " " "
Y-12	0.6961 " " "
LASL	0.6943 " " "
NFS	0.6937 " " "

Since NBL, Y-12, and LASL used high precision titrimetric procedures, while WANL and NFS used the routine gravimetric procedure discussed above, the best estimate of the true value probably is about 0.696. It is not unlikely that NFS and possibly LASL experienced some loss of sample due to "popping" during ignition.

APPENDIX A - Attachment 2

METHOD 1.101

GRAVIMETRIC–VOLUMETRIC DETERMINATION OF URANIUM IN OXIDE–ORGANIC DISPERSIONS*

DRAFT

1. Scope

This method is applicable to the determination of uranium in uranium oxide dispersions in graphite and in polystyrene or other plastic-dispersion media.

2. Summary of Method

The material to be analyzed is thermally decomposed, and the residue is ignited to 900°C. Uranium is determined either gravimetrically with correction for impurities or volumetrically.

3. Procedure

1. Gravimetric. a. Ignite a platinum crucible or dish to constant weight at 900°C.

b. Accurately weigh a sample estimated to contain from 1 to 5 g of uranium into the platinum crucible, and ignite it in a muffle furnace. For polystyrene or other plastic samples, begin the ignition at about 250°C. After all material volatile at 250°C has been removed, gradually increase the temperature to 900°C.

c. Continue the ignition until all material volatile at 900°C has been removed. Ignition for 30 min at 900°C may be sufficient for plastics, but an ignition time of several hours to overnight may be required for graphite mixtures. Passing filtered oxygen over the sample will accelerate the ignition.

d. After all material volatile at 900°C has been removed, ignite the sample to constant weight at 900°C in air.

e. With an emission spectrograph determine the metallic impurities in the ignited sample. See Methods A, B, and D in the Appendix.

f. Calculate the uranium content as described in Method 1.100.

2. Volumetric. a. Accurately weigh a sample estimated to contain about 200 mg of uranium into a platinum dish or crucible.

b. Ignite the sample to constant weight as described in Sec. C1 of this method.

c. Dissolve the residue from the ignition in 3 ml of concentrated nitric acid.

d. If an insoluble residue remains, filter the solution through a Whatman

*Submitted by R. W. Bane, Argonne National Laboratory, Argonne, Ill.

No. 41 filter paper (hardened), and wash the paper and residue free of acid with hot water. Retain the filtrate and washings.

e. Ash the paper and residue in a platinum crucible.

f. Treat the residue in the platinum crucible with a few drops of sulfuric acid (1 + 1) and 10 ml of concentrated hydrofluoric acid.

g. Evaporate the contents of the crucible to dryness and ignite for 10 min at 900°C.

h. Dissolve the ignited residue in 5 ml of concentrated nitric acid, and quantitatively transfer the solution to the retained filtrate and washings from the initial filtration.

i. Add 5 ml of concentrated sulfuric acid to the combined solution, and evaporate to SO_3 fumes.

j. Cool the solution, rinse the sides of the beaker with water, and, without adding additional acid, repeat the fuming twice to ensure removal of all nitrate ion.

k. Determine the uranium content as directed in Method 1.200, beginning with Sec. F6, step a.

APPENDIX B

TRANSFERS TO FOREIGN ENTITIES
License No. SNM-145 - Uranium Enriched in the Isotope 235
Nuclear Materials and Equipment Corporation, Apollo, Pennsylvania
for the Period December 1, 1957 to October 31, 1965

Date Shipped	Destination	Material Description	Unit Gram Uranium	Percent Isotope	U-235
8/7/58	U.S. Exhibit, Switzerland	UO_2	7,521	19.94	1,500
10/30/58	France	UO_2	4,407	1.50	66
12/30/58	"	UO_2	487,969	1.50	7,359
12/26/58	"	UO_2	489,886	1.50	7,387
12/12/58	"	UO_2	487,422	1.51	7,350
12/17/58	"	UO_2	488,567	1.51	7,368
12/19/58	"	UO_2	486,600	1.51	7,338
1/30/59	"	UO_2	321,461	1.50	4,848
1/9/59	"	UO_2	485,360	1.50	7,319
1/14/59	"	UO_2	324,227	1.50	4,889
2/25/59	"	UO_2	74,330	1.50	1,121
2/25/59	"	UO_2	43,923	3.49	1,533
4/22/59	"	UO_2	170,119	3.49	5,935
5/14/59	Canada	UO_2 Powder	39,989*	6.99	2,794*
5/29/59	France	UO_2	70,241	3.49	2,451
5/4/59	"	UO_2	200,451	3.49	6,994
7/3/59	Italy	Uranyl Sulfate	7,523	19.94	1,500
9/4/59	France	UO_2	70,006	3.49	2,443
9/18/59	"	UO_2	72,059	3.49	2,515
10/16/59	"	UO_2	16,966	3.49	592
11/10/59	Australia	Metal Powder	500*	93.40	467*
4/20/60	France	U Dioxide Powder	127*	19.83	25*
4/20/60	"	Metal Blend	(21*	93.00	20*
			(80	Normal	0
11/9/60	Japan	Uranium Dioxide	54,067	20.00	10,732
11/10/60	"	Uranium Dioxide	22,231	20.00	4,413
7/11/61	France	UO_3 Powder	107,384	2.984	3,204
7/11/61	"	UO_3 Powder	1,475	90.00	1,328
8/24/61	"	U Dioxide Powder	15,000	20.0568	3,009
4/19/62	"	U Dioxide Pellets	9,130	4.025	367
4/19/62	"	U Dioxide Pellets	9,110	4.52	412
4/19/62	"	U Dioxide Powder	5,265	4.50	238
6/15/62	Italy	U Dioxide Pellets	47,976	19.96	9,576
7/31/62	Japan	$UO_2(NO_3)_2$ and U_3O_8 Powder	21*	93.16	20*
8/24/62	Netherlands	U Dioxide Pellets	390,187	3.136	12,236
9/7/62	"	U Dioxide "	370,669	3.136	11,624
10/11/62	"	UO_2 Pellets	316,139	3.813	12,054

Unit Gram

Date Shipped	Destination	Material Description	Uranium	Percent Isotope	U-235
10/12/62	Netherlands	UO_2 Pellets	313,986	3.813	11,972
11/2/62	"	UO_2 Pellets	58,385	3.813	2,227
11/2/62	"	UO_2 Pellets	32,553	3.136	1,021
11/2/62	"	UO_2 Pellets	104,754	3.813	3,994
11/23/62	France	UO_3 Powder	4,000	89.82	3,593
11/23/62	"	ADU Powder	10,027*	19.86	1,991*
11/30/62	Netherlands	UO_2 Pellets	19,423	3.136	609
11/30/62	"	UO_2 Pellets	1,664	3.813	63
1/27/63	Italy	Al clad U_3O_8 Fuel Plates	12,360	19.83	2,451
5/9/63	France	UO_2 Powder	300,227	4.027	12,090
4/25/63	"	ADU Powder	20,998	60.03	12,605
4/26/63	"	ADU Powder	20,998	60.03	12,605
9/26/63	United Kingdom	Fused UO_2	88,125*	2.90	2,555*
3/27/64	Canada	UO_2 Pellets	131,008	6.00	7,860
3/30/64	Germany	UO_2 Pellets	286	1.00	3
3/30/64	"	UO_2 Pellets	282	1.50	4
3/30/64	"	UO_2 Pellets	283	2.00	6
3/30/64	"	UO_2 Pellets	286	2.50	7
3/30/64	"	UO_2 Pellets	285	3.00	8
3/30/64	"	UO_2 Pellets	286	3.50	10
3/30/64	"	UO_2 Pellets	281	4.00	11
3/30/64	"	UO_2 Pellets	282	4.50	13
3/30/64	"	UO_2 Pellets	446,266	5.02	22,403
4/20/64	France	ADU Powder	84,809	6.00	5,089
4/24/64	Japan	UF_6	49,230	5.704	2,808
4/24/64	"	UF_6	5,297	4.981	264
5/18/64	France	UO_2 Powder	300,000	4.00	11,970
7/13/64	"	ADU Powder	100,000	59.98	59,980
9/2/64	"	UO_2 Pellets	130,513	3.99	5,207
9/15/64	Japan	UF_6	164,721	2.598	4,280
10/13/64	Sweden	UO_2 Powder	52,578*	5.00	2,629*
12/14/64	France	UO_2 Powder	48,916	3.99	1,952
1/13/65	Italy	Al clad U_3O_8 Fuel Plates	5,034	19.83	998
3/13/65	France	UO_2 Powder	481,690	3.977	19,157
4/5/65	"	ADU Powder	100,000	59.93	59,930
10/4/65	Japan	Foils and UO_2 Powder	4	93.00	4
Total NUMEC Foreign Transfers 12/1/57 to 10/31/65			8,788,246		425,396

*Indicate sales transactions which equal or total 191 kgs uranium and 11 kgs U-235. All other transactions represent material which is leased.

blended material into sinter stock; (4) sintering of the pressed material; (5) crushing of the sintered stock to form melt stock; (6) melting of the material by direct arc to form carbide ingots; (7) crushing, grinding and sizing of the ingots to form fine on-size particles; (8) spheroidizing of the particles in a plasma torch; (9) carbon coating of the spherical particles in an induction heated fluid bed reactor in an atmosphere of methane and an inert carrier gas.

Although the foregoing is only a brief description of the process, it may serve to illustrate the complexity of the manufacturing operation which may be characterized fairly as an extremely dirty and dusty process. As described below, more fully, NUMEC's product yield in this process was quite low, necessitating an extensive recycling of material in order to deliver sufficient product to the customer. Extensive recycling of material, as you know, inevitably involves a repetition of losses.

As noted earlier, the manufacture of this material was, for NUMEC, a "first of a kind contract"; it has never been performed again by the Company. Consequently, our direct experience factors are limited in terms of comparing the losses on this job with other contracts. Nevertheless, we believe it is not inconceivable that high losses* -- perhaps up to 30 kilograms of material (or 3%) -- may have been experienced in this unique and complex operation. For instance, on jobs involving the same number of unit operations, but on material inherently less dusty in nature, we have experienced losses of the same magnitude.

Even assuming, however, that such losses were experienced, this will not fully explain the disposition of the total amount of U-235 presently unaccounted for, approximately 6 percent of the total U-235 received by NUMEC for processing under the contract. Such an explanation must be derived from an examination of NUMEC's scrap recovery operations.

Scrap Generated Under 1231 Contract

The basic reference point in an inquiry into the disposition of 1231 material must be the amount of scrap generated under the contract.

*As used in this context, losses are defined as both the accounted for and the unaccounted for losses, i.e., all material not shipped to the customer as [illegible] to the [illegible] of recovered final scrap.

The records of NUMEC's CP-2 facility, in which the initial conversion of UF_6 to UO_2 was performed, show that 1240 kilograms of material entered the facility for conversion under the 1231 contract. It should be noted, however, that only 1087 kilograms of UF_6 containing 93+ percent U-235 were furnished by the customer for conversion under the contract. The difference (153 kilograms) represents the quantity of recycled material required to make the final product accepted by the customer. It is, therefore, apparent that 153 kilograms of recycle material were, at some point, reprocessed in NUMEC's facilities. Illustrative of the process by which such recycle material is generated is the initial conversion (UF_6 to UO_2) in the CP-2 facility. NUMEC's records show that this conversion was performed in six discrete batches of approximately 163, 272, 252, 150 and 250 kilograms each, spaced three months apart between October 1962 and October, 1963. One would expect to leave behind, in the first pass through the facility, approximately ten kilograms of material from each batch. This non-yield uranium settles in clean-up materials and in the form of other wastes which are subsequently recovered and recycled. Thus, in the initial step of the process, at least 50 of the 153 kilograms of scrap described above, were generated.

It is also clear, in view of the fact that 1087 kilograms were processed to produce 763 kilograms of end product [illegible] that NUMEC had as inventory, after final product shipment, some 324 kilograms of material (process losses aside) which it was required to reprocess.

Finally, it should be noted that 65 kilograms of uranium, in the form of UO_2 prepared by NUMEC from the aforementioned scrap, were rejected by the customer. This material, too, required reprocessing.

In summary, a total of 542 kilograms (153 + 324 + 65) of scrap uranium, generated under the 1231 contract, were at various times injected into NUMEC's scrap recovery stream. It is in the reprocessing of this 542 kilograms of material that there exists the greatest possibility of mixing and consequent allocation of special nuclear material to other contracts.

The Nature of NUMEC's Scrap Recovery Operations

The possibility for the allocation of materials generated in the recovery of scrap to contracts other than 1231 is quite great in view of the manner in which NUMEC's scrap recovery operation was conducted.

A scrap recovery facility, in a company handling a large number of special nuclear materials contracts each year, cannot be reserved for an extended period of time to recover all of the scrap that may be generated

under a contract which may require a year or more to complete and which, from time to time, may generate quantities of scrap material. Of necessity, the scrap from a long-term contract must be scheduled for recovery intermittently with scrap material from other contracts. Such was the case with respect to the 1231 scrap material.

A major clean-up between jobs would be required in order to insure against the downgrading of material in an intermittent operation of this type. Such a clean-up itself, however, will generate additional losses since material is bound to be lost in the huge amounts of solution required to adequately clean the complex equipment in the plant.

Moreover, since the scrap recovery operation involves a solvent extraction process, one must reach near saturation equilibrium in the plant before extracted material is chemically clean. Thus, the first material removed from the process must always be recycled to achieve clean material. Correspondingly, the material last removed from the process is, as a general matter, never pure enough to be used in end product and, therefore, again becomes scrap.

The foregoing suggests the economic infeasibility, if not the practical impossibility of totally segregating each job in a plant with a view toward "finishing" each job before moving to the next. To offset these consequences, it was NUMEC's practice to segregate material by contract only through the point of dissolution, at which point the accountability under a given contract was established. Thereafter, our scrap recovery equipment was operated on a "heel to toe" basis without segregation of material between jobs. Thus, if scrap from ten jobs, for example, was processed in one recovery campaign, certain assumptions had to be made in assigning the recovered material between the originating contracts. This assignment was made on a basis proportionate to each contract's feed contribution. Losses were calculated in the manner described below. We believe that this method of scrap recovery operation is generally consistent with industry practice.

Disposition of 1231 Material (1962-63)

With this information as background, it becomes pertinent to examine the scrap recovery contracts most likely processed at NUMEC during the same time the 1231 contract was active. Table I, attached, lists these contracts. We believe these jobs were run on a "heel to toe" basis in conjunction with the recycle and/or scrap material from Contract 1231. Excluded, however, are those contracts involving the processing of uranium of less than 5% enrichment. Since NUMEC maintained a separate reprocessing facility for material less than 5% enriched, it is unlikely that such material would have been [illegible]

The total quantity of uranium represented by the contracts in Table I is approximately 470 kilograms of U-235. These jobs were closed out with an average overall U-235 loss of approximately 1.5 per cent, or 7 kilograms. The average 1.5 per cent loss figure was selected on the basis of our best estimate, at the time, of the losses experienced in our recovery operation. A definite figure could not be established since, in the "heel to toe" process, described above, there was no complete clean-up between reprocessing campaigns. It is important to note, at this point, that due to the complexity and quantity of the scrap on hand during 1962-1963, there was a large uncertainty with respect to total plant accountability during this period. As a result there was no clear evidence, at the time, to indicate that the 1.5 per cent figure was inaccurate.

It was only within the last year, during which NUMEC performed two large scrap contracts of 108 kilograms [AT(40-1)3309] and 137 kilograms [AT(40-1)3376] that it became evident that the losses were greater than those initially anticipated. In both cases, a closed accountability was maintained; that is, there was no "cross-over" between jobs. In the first case, losses were 4.1 per cent; in the second, 3.0 per cent. (The second contract is approximate because final accountability has not been established.) In both cases the scrap involved was similar in nature to that processed during 1962-1963 and, accordingly, utilized nearly the same process chemistry and equipment. On the basis of our current experience, it would appear that a loss factor of 3.5 per cent may have been more appropriate than one per cent. On this basis, the losses experienced under the scrap recovery contracts itemized in Table I could have been 16.5 kilograms instead of the 7 kilograms declared. This would suggest that approximately 9 kilograms of 1231 contract U-235 could have been inadvertently mixed and returned with material under these scrap recovery contracts.

To further substantiate the possibility of mixing of material from the 1231 contract, we refer you to a letter of July 8, 1963, from A. H. Kasberg, NUMEC, to T. C. Johnson, Westinghouse Astronuclear, a copy of which is attached. This letter indicates that 30 kilograms of out-of-specification UO_2 (26.3 kgs of U) was scheduled for scrap return to Oak Ridge. The only supporting evidence to show that this material was returned is an entry on NE-CCC-95, a copy of which is attached, indicating that only 21.4 kilograms of uranium, slightly downgraded, was returned. This suggests the possibility that 4.6 kilograms of 1231 contract material may have in the course of scrap recovery, been returned under other contracts.

A further example is illustrated in the attached memo of October 5, 1965, from C. Beltran, NUMEC, to F. Porscher, NUMEC, describing a degradation incident involving 2.7 kilograms of 1231 contract material. We find no evidence [illegible] material was returned along with other scrap material and subsequently returned, although possibly misidentified.

These are but examples of specific instances in which 1231 contract material might have been mixed with other scrap. The fact of overriding importance, however, is that because of the nature of NUMEC's scrap recovery operations, it is highly probable that scrap from the 1231 contract may have been returned under other purchase orders.

Disposition of 1231 Material as a Function of Overall Company Operations (1960-1963)

The foregoing analysis covers only the period during which 1231 contract material was being processed at NUMEC. It is important to note, however, that the same type of scrap recovery operation was conducted at NUMEC prior to the arrival of the 1231 material creating the same possibility of unavoidable mixing of material. In the period, prior to and during which, 1231 material was being processed at NUMEC, a large number of scrap recovery contracts involving 1020 kilograms U-235 in scrap were processed and closed including contracts shown in Table I, plus additional contracts shown in Table II. Using an estimated average 1.5 per cent loss figure, NUMEC declared losses of approximately 15 kilograms U-235 on these contracts. Had the more recently derived loss figure of 3.5 per cent been used, losses could have amounted to 36 kilograms U-235.

It is possible that the difference, amounting to 21 kilograms U-235 was compensated for through the return of scrap material from other purchase orders closed out before, and during, the 1231 contract. Scrap from the 1231 contract, it can be reasonably surmised, may in turn, have been returned under these purchase orders. Although it is not possible to state that a given amount of 1231 material was returned under another given purchase order, it is nevertheless probable that the net difference - 21 kilograms - (which includes the 9 kilograms discussed above) has, in fact, come to reside in the 1231 contract.

The 1231 contract has become the final depository of these estimated losses through a chain of relatively recent events. It is only within the past year, that through a concerted measurement effort and a reduction in the NUMEC inventory, it became possible to measure with a reasonable certainty, the materials loss experienced at NUMEC. After a close-out of all inactive NUMEC contracts, only the 1231 contract remained as the identifiable point for all other prior misassigned losses.

With respect to NUMEC's over-all facility operation, I believe your analysis will indicate that NUMEC's loss experience is well within the range one might reasonably expect in a facility such as ours. Moreover, our loss experience is probably not significantly higher than that of other facilities of a like nature. Accordingly, the possibility of any diversion of special nuclear material can be discounted with reasonable certainty.

I hope that this information will assist you in your investigation of this matter. Should you desire any further information, please do not hesitate to call on us.

Very truly yours,

S. A. Weber
Accountability Representative

SAW/geo

COPY

cc: RE CO-1231
ANK
FF
Chron

July 8, 1963

Ref: CO-1231

Mr. T. Johnson
Purchasing Department
Westinghouse Electric Corporation
Astronuclear Laboratory
P.O. Box 10864
Pittsburgh 36, Pennsylvania

Subject: Status of P.O. #57-NP-12674

Dear Mr. Johnson:

On 7-3-73 lot numbers 68, 77 and 78 were shipped on the above purchase order. The total of shi½ments to date, minus reject material, is approximately 440 kg as uranium. Lot numbers 74, 75, 76, 79, 80 and 81 were completed but rejected at NUMEC on the basis of substrate carbon analysis below specification. Material that would have made lot numbers 82 and 83 was rejected at NUMEC before coating on the basis of low carbon. Recycling of the above material has been started. The last 30 kg of recycled UO_2 that was to have entered the system was found to be slightly degraded in isotope, consequently, this material was scrapped.

Approximately 150 kg of UF_6 has been converted to UO_2 and is ready for carbide production. We are currently shut down for AEC inventory and plant reroofing. We will start carbide production as soon as possible after the roof is complete. We have scheduled 3 and 4 shift operation for completion of this order. Completion will require 6 weeks of production operations with delivery of the first lots 3 weeks after startup.

We trust that the above information meets with your approval. If you have any questions, don't hesitate to contact me.

Very truly yours,

A. H. Kasberg

AHK/mhb

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COPY

NUMEC

WANL Purchase Order 59-NP-12674

Status Report - As of December 28, 1963

/

All Values - Kg. of Uranium

OPERATION	CUMULATIVE
Uranium Received	1240
Converted to Oxide	1140
Arc Melted (Virgin)	1114
Released to Spheradize	1095
Classified	1059
Final Processing	869
Released for Inspection	794
Rejects	72
To be Certified	42
*Certified	90
Shipped	590

*78 Kgs of this quantity has been transferred to WANL account at NUMEC.

(s) L. A. Hughes

COPY

[illegible] & Equip... Corp. | [illegible] Carbide Nuclear Company | [illegible] | CCC | 95
[illegible] P. Frank | D. McCluen
(Representative) | (SS Representative)

[illegible] Avenue | [illegible] K-25 Plant
[illegible], [illegible]ania | Oak Ridge, Tennessee

5. C.	6. LOU[illegible]	7. CAR NO. & INITIALS	8. SEALS NOS.
	NUMEC Truck		

Highly [illegible]iched UO_2 from internal scrap recovery

P.O. [illegible] (NUMEC 1231)

11. DOCUMENTATION
a. Page 1 of 1 Pages
b. Copy 1 of 5 Copies
c. Series

9. No.	DISTRIBUTION OF COPIES	
1	CCC	[illegible]
2	CCC	
3	CCC	CPA
4	CPA	
5	[illegible]	
6		
7		
8		
9		

SHIPPER'S DATA

B. From [illegible] No.	C. Date Material Shipped	D. Date Doc. [illegible]ed
CH-42001-01-1	8/22/63	8/23/63

[illegible] P. Frank [signature]

Sand [illegible] NUMEC Assay

H. Chem.-L.E.	I. Isotopic - L.E.	J. Total--L.E.

13. RECEIVER'S DATA

A. To--Proj. No.	B. Date Material Received	C. Date Document Dispatched
	8-22-63	SEP 9 1963

D. Signature of Receiver (SS Representative) [signature]

E. Measurement Method

SHIPPER'S DATA ACCEPTED

F. Net Wt.-L.E.	G. Chem.-L.E.	H. Isotopic-L.E.	I. Total--L.E.

[illegible]	N. Tare	O. Net	P. Element	Q. Isotope	J. Gross	K. Tare	L. Net	M. Element	N. Isotope
		24,470	21,377	[illegible],806	SEP	MBR			

92.65%

[illegible] GPO

TO: F. Forscher DATE: October 5, 1963

FROM: C. Beltram

SUBJECT: Mix-up of Boats Between Job 1231 (93%) and N-0723 (Depleted)

What happened:

At about 10:00 A.M. on October 3, Jim Hart agreed to process a rush job for Roy Cline involving the reduction of 1831 grams of depleted binary powder through the CP-2 Lindberg mesh belt furnace. Verbal instructions were given by Jim Hart to the furnace operator, Spang, for the immediate reduction of the depleted binary. Spang's primary function at this time was feed preparation operator for the 4" column, but he was feeding trays of 93% U_3O_8 into the reduction furnace as time permitted. Spang placed two empty boats before and after the two boats containing the depleted binary.

In the meantime, Lloyd Hughes had arranged for Ed Wright to temporarily transfer Hepler from PC-3 to the CP-2 furnace operation in order to reduce 1231 material on a full time basis. Hepler was not apprised of the two boats of depleted and treated all boats existing in the furnace as 93%. Hughes did not know there was depleted in the furnace and Hart did not know Spang had been replaced.

Consequences: 1402 - 4122 grams U containing 2660 grams. 93% UNH material

A total of 4857 grams of "mixed" enrichment resulted, containing 60.7% U-235. C. Ellison has effectively upgraded a sample of the mixed material to 87.7%. The upgrading is possible due to the distinct chemical and physical differences between the depleted binary and the enriched UO_2. The value difference between the 87.7% material and the 93% material is $84. The incident cost us this $84, plus the labor involved to "upgrade" the mixture, and the labor expended in making the depleted binary and the enriched U_3O_8. It is estimated that the total dollar cost of the incident is less than $300. There is an equal or greater value which can be assessed to the lesson that was learned and discussed in detail with all Production Supervisors and Foremen.

What was done wrong:

1. Material transfer form was not used.

2. Written instructions were not given to the operator.

3. Foreman on the plan [illegible] not knowledge of the different work being processed in the furnace.

What was done right:

1. Ed Wright brought the relief man, Hepler, up to the CP-2 Foreman, Condo
2. The calcining boats were cleaned out prior to and after the depleted binary was run.
3. CP-2 cooperated with CH-3 by accommodating their immediate need for the reduction of the depleted binary.

/mel

TABLE I
Page 2

C	LOT	TRANS. NO.	SHIPPERS VALUES U	SHIPPERS VALUES U-235	SHIPPERS VALUES %Enr.	FIN. RESP. U	FIN. RESP. U-235	FIN. RESP. %Enr.	DATE MAT. REC'D	SHIPMENTS U	SHIPMENTS U-235	SHIPMENTS %Enr.	LOSSES U	LOSSES U%	LOSSES U-235	LOSSES U-235%
(40-1)3047	40A	MAC...NEE-3	25826	24054	93.14	24692	22504	91.14	Mar.-63	24521	22518	91.83	171	.69	(14)	(.06)
(40-1)3047	40B	CFC ...C-2	41620	38765	93.14	36919	34279	92.85	May-63	36053	33017	91.58	866	2.35	1262	3.68
(40-1)3047	40C	WFD...C-5	6644	6189	93.15	6450	6006	93.12	Apr.-63	6428	5953	92.61	22	.34	53	.88
(40-1)3047	40E	WEB ...16	1709	430	25.16	1673	398	23.81	Apr.-63	1649	436	26.43	24	1.43	(38)	(9.55)
(40-1)3048	39E	ANL...C-5	47906	23057	48.13	41681	20049	48.10	May-63	40611	19843	48.86	1070	2.57	206	1.03
(40-1)3048	39F	ANL...C-6	3893	3628	93.19	3405	3165	92.95	May-63	3388	3132	92.43	17	.50	33	1.04
(40-1)3048	39H	SCE...C-8,9,10	52982	49278	93.15	50163	46702	93.10	Apr.-63	49905	46237	92.65	258	.51	465	1.00
(40-1)3048	39J	WE...C-17	23518	21853	92.92	22281	20670	92.77	Apr.-63	22059	20464	92.77	222	1.00	206	1.00
(40-1)3048	39K	ATC...C-5	22660	21144	93.31	20573	18633	90.57	Apr.-63	20053	18421	91.86	520	2.53	212	1.14
(40-1)3048	39L	ATC...C-6	914	437	47.81	906	429	47.40	Apr.-63	881	425	48.25	25	2.76	4	.93
(40-1)3173	46C	CI...C-2,3	745	693	93.00	643	584	90.78	Dec.-63	625	575	91.92	18	2.80	9	1.54
(40-1)3215	45D	B...C-3,4,5,6,7,	15312	14268	93.18	13777	12793	92.86	Apr.-64 May-64	13950	12749	91.39	(173)	(1.26)	44	.34
(40-1)3251	49G	CA...C-1	1839	1716	93.31	1459	1350	92.56	July-64	1431	1322	92.38	28	1.92	28	2.07
(40-1)3251	49C	CA...C-1	47239	3056	6.47	43812	2905	6.63	July-64	42692	2843	6.66	1120	2.56	62	2.13
						416469	293681			410948	290125		5521			

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LOT	TRANS. NO.	SHIPPERS VALUES U	U-235	%Enr.	FIN. RESP. U	U-235	%Enr.	DATE MAT. REC'D	SHIPMENTS U	U-235	%Enr.	LOSSES U	U%	U-235	U-235%	INCLUSIVE DATES SHIPPED
49H	MAD-FAP-1	157544	146784	93.17	157356	146603	93.17	July-64	157274	146532	93.17	82	.05	76	.05	12/64
49I	MIO-FAP-1	30799	28643	93.00	28743	26622	92.62	June-64	28299	26160	92.44	444	1.54	462	1.74	9/64-1/65
	Sample Contract				8474	3085	36.05		9019	399	4.42	(545)	(6.43)	2686	87.06	
					611042	469958	76.92		605540	463216	76.50	5502	.900	6782	1.443	

on from A C Form OR 653 and in those cases where applicable, does not show upgrading when it was disallowed.

TABLE II

C	LOT	TRANS. NO.	SHIPPERS VALUES U	SHIPPERS VALUES U-235	SHIPPERS VALUES %Enr.	FIN. RESP. U	FIN. RESP. U-235	FIN. RESP. %Enr.	DATE MAT. REC'D	SHIPMENTS U	SHIPMENTS U-235	SHIPMENTS %Enr.	LOSSES U	LOSSES U%	LOSSES U-235	LOSSES U-235%
'(30-1)2432	3-A	MSH-MEC-1,3,4, 6,7	29395	27371	93.11	26304	24463	93.00	Oct.-59	26149	24319	93.00	155	.59	144	.59
'(30-1)2432	3-B	MSH-MEC-1	23963	22325	93.16	23076	21495	93.15	Nov.-59	22821	21235	93.05	255	1.11	260	1.21
-60-1237-2	5-D	WEB-MEC-5R-6R	10416	9703	93.15	8069	7504	93.00	Mar.-60	8012	7451	93.00	57	.71	53	.71
-60-1881	8-A	MAC-MEC-1	14256	13278	93.14	13645	12690	93.00	Apr.-60	13550	12602	93.00	95	.69	88	.69
'(30-1)2603	10A	MAC-MEC-2	18817	17530	93.16	16794	1561.8	93.00	July-60	16665	15498	93.00	129	.77	120	.77
'(30-1)2603	10B	MAC-MEC-3	751	700	93.21	042	507	93.00	July-61	637	592	93.00	5	.78	5	.78
'(30-1)2603	10E	WEB-MEC-12,13 14,15	2944	2734	92.87	1082	1666	88.53	July 60	1882	1663	88.36	0	--	3	.18
'(30-1)2603	10F	MIC-MEC-14	254	226	88.98	237	207	87.53	July-60	229	192	83.92	8	3.38	15	7.25
'(30-1)2603	10G	WEB-MEC-10,-15	3228	2993	92.72	3164	2602	82.23	June 60	3135	2578	82.23*	29	.92	24	.92
'(30-1)2603	10I	WEB-MEC-10,11	12364	1826	14.77	10516	1577	15.00	July-60	10445	1534	14.69	71	.68	43	2.73
'(30-1)2642	12A	SOM-MEC-1,2	9849	9179	93.20	8855	8235	93.00	Jan.-60	8771	8157	93.00	84	.95	78	.95
'(30-1)2642	12B	MIC-MEC-1	15886	14884	93.69	15090	13734	91.346	Sept.-60	14820	13537	91.346*	270	1.79	247	1.79
'(30-1)2642	12C	SOM-MEC-3	1838	1712	93.14	1402	1304	93.00	Sept.-60	1393	1296	93.00*	9	.64	8	.64
'(30-1)2677	13B	CO[illegible]MEC-2A CO[illegible]MEC-4-6-12	25331	23603	93.18	24146	22444	92.95	Dec.-60 Jan.-61	23923	22236	92.95	223	.92	208	.92
'(30-1)2677	13C	CO[illegible]MEC-5cc	28723	26764	93.18	29567	27512	93.05	Dec.-60	29272	27226	93.01	295	1.00	286	1.[illegible]
'(30-1)2707	15A	WEB-MEC-27	5424	5051	93.12	5527	5060	91.55	Dec.-60	5480	5017	91.55*	47	.85	43	.85
						[illegible]16	166758			137[illegible]	66133		17[illegible]		16[illegible]	

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	LOT	TRANS. NO.	SHIPPERS VALUES U	U-235	%Enr.	FIN. RESP. U	U-235	%Enr.	DATE MAT. REC'D	SHIPMENTS U	U-235	%Enr.	LOSSES U	U%	U-235	U-235%
(30-1)2707	15B	WEB-MEC-25	3285	3060	93.15	3180	2956	92.96	Dec.-60	3157	2920	92.48	23	.72	36	1.22
(30-1)2707	15C	WFP-MEC-4,5,6,7,	5176	4821	93.14	4491	4153	92.52	Feb.-61	4458	4105	92.09	33	.73	50	1.20
(30-1)2707	15D	SCH-MEC-4,5,6,7,8,	24673	22981	93.14	20098	18704	93.065	Mar.-61	19948	18552	93.00	150	.75	152	.81
(30-1)2707	15E	SCH-MEC-9	8013	7464	93.15	7518	6988	92.95	Dec.-60	7462	6817	91.36	56	.74	171	2.45
(30-1)2707	15F	MAC-MEC-5	7675	7149	93.15	7291	6528	89.53	Dec.-60	7240	6482	89.53*	51	.70	46	.70
-61-1472	14D	WEB-MEC-26cc	478	357	74.69	473	353	74.67	Mar.-61	470	350	74.67*	3	.63	3	.63
-61-1472	14E	WEB-MEC-1	400	375	93.75	348	324	92.96	Mar.-61	348	322	92.65	--	--	2	.62
-61-1806	17A	SCH-MEC-8	460	429	93.26	400	372	93.03	Mar.-61	400	372	93.03	--	--	--	--
(30-1)2762	16A	WEB-MEC-52	385	334	86.75	380	330	86.86	Apr.-61	377	327	86.86*	3	.79	3	.79
(30-1)2762	16B	WEB-MEC-30,37,41,46,47	16669	15411	92.45	16377	15227	92.98	Apr.-61 Feb.-62	16377	15093	92.162	0	--	134	.88
(30-1)2762	16C	SCH-MEC-10cc, 11cc,12cc	14437	13248	91.76	12854	11961	93.05	Apr.-61	12700	11802	92.93	154	1.20	159	1.33
		Sample Recovery Contract **				2218	2053	92.6	--	--	--	--	2218	100.	2053	100.
		Sample Recovery Contract **				778	82	10.5	--	--	--	--	778	100.	82	100.
-61-1833-2	18D	WFP-MEC-3	8704	8109	93.16	8503	7913	93.06	Apr.-61	8440	7819	92.64	63	.74	94	1.19
-61-1834	19B	WFP-MEC-9	1529	1425	93.20	1415	1318	93.128	May-61	1404	1281	91.28	11	.78	37	2.81
-61-1834-2	19C	SCH-MEC-13,14	7083	6598	93.15	6606	6150	93.10	May-61	6556	6099	93.03	50	.76	51	.83
-61-1834	19D	WEB-MEC-32	10206	9496	93.04	12213	11341	92.86	May-61	12123	11058	91.22	90	.74	283	2.50
						2[illegible]	[illegible]			2[illegible]	253532		5415		4901	

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C	LOT	TRANS. NO.	SHIPPERS VALUES U	SHIPPERS VALUES U-235	SHIPPERS VALUES %Enr.	FIN. RESP. U	FIN. RESP. U-235	FIN. RESP. %Enr.	DATE MAT. REC'D	SHIPMENTS U	SHIPMENTS U-235	SHIPMENTS %Enr.	LOSSES U	LOSSES U%	LOSSES U-235	LOSSES U-235%
-61-1834	19E	WE-EC-33	32772	514	15.68	29672	448	15.1	May-61	29713	438	14.73	(41)	(.14)	10	2.23
(30-1)2633	20H	AIC-EC-16	994	925	93.05	964	778	80.67	Sept.-61	952	768	80.67*	12	1.24	10	1.24
(30-1)2833	20J	LAE-EC-3-5	33787	31479	93.17	26190	24299	92.78	Aug.-61	26190	24299	92.78	--	--	--	
(30-1)2833	20K	LAE-EC-1,2,4,5,6,	55788	51978	93.17	56398	52461	93.02	Aug.-61	56045	52127	93.01	353	.63	334	.64
(30-1)2843	22A	SCH-EC-15-16	9149	8523	93.16	7980	7431	93.126	July-61	7920	7343	92.71	60	.75	88	1.18
(30-1)2843	22D	WC-EC-5	826	770	93.22	715	651	91.1	July-61	710	647	91.1	5	.70	4	.70
(30-1)2843	22F	W-EC-39cc	32686	3530	10.8	32180	3475	10.8	July-61	31907	3446	10.8*	273	.85	29	.85
(30-1)2843	22G	W-EC-40	1210	1127	93.14	495	459	90.784	July-61	491	446	90.784*	4	.81	3	.81
(30-1)2843	22H	C-EC-14,15,16,17,18,	40394	37638	93.18	33882	31388	92.64	July-61	33074	30587	92.48	808	2.38	801	2.55
(30-1)2874	24B	A-EC-1	927	863	93.09	877	793	90.452	Sept.-61	832	752	90.452	45	5.13	41	5.13
(30-1)2874	24F	SC-EC-20-23	11057	10300	93.15	10050	9343	92.966	Oct.61	9971	9147	91.74	79	.79	196	2.10
(30-1)2893	25	SC-EC-10	3807	3554	93.35	2949	2707	91.808	Nov.-61	2923	2684	91.808*	26	.88	23	.88
(30-1)2893	25B	SCH-EC-24	3646	3396	93.14	3584	3333	92.997	Nov.-61	3557	3308	92.997*	27	.75	25	.75
(30-1)2893	25	W-EC-44	8860	8248	93.09	7861	7281	92.62	Oct.-61	7848	7231	92.15	13	.17	50	.69
(30-1)2893	25	-EC-44	2994	2789	93.16	2399	2174	92.93	Oct.-61	2317	2149	92.76	22	.94	25	1.15
(30-1)2893		S-EC-9,11	2570	2394	93.15	2604	2412	92.26	Dec.-61	2596	2135	82.26	8	.31	7	.31
-61-2893	25	W-EC-8,9	5084	4736	93.15	4830	4331	92.89	Dec.-61	4573	4246	92.86	57	1.23	55	1.38

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	LOT	TRANS. NO.	SHIPPERS VALUES U	SHIPPERS VALUES U-235	SHIPPERS VALUES %Enr.	FIN. RESP. U	FIN. RESP. U-235	FIN. RESP. %Enr.	DATE MAT. REC'D	SHIPMENTS U	SHIPMENTS U-235	SHIPMENTS %Enr.	LOSSES U	LOSSES U%	LOSSES U-235	LOSSES U-235%
(30-1)2893	25L	WEP-MTC-44	18941	17640	93.13	18355	17049	92.885	Oct.-61	18206	16910	92.885	149	.81	139	.81
						129	53	41.19	Oct.-61	-0-	-0-	-0-	129	100.	53	100.
-62-75-4	24D & G	SCM-MTC-18,19, 21,22,	25391	23632	93.07	25009	23276	93.07	Oct.-61	24821	23101	93.07	188	.75	175	.75
62-220-8	26F	WCE-MTC-16	78	73	93.00	123	99	80.56	May-62	105	85	80.56*	18	14.63	14	14.63
(30-1)2947	27J	WPE-MTC-45	21497	20070	93.36	21309	19845	93.13	Dec.-61	21007	19541	93.02	302	1.42	304	1.53
(30-1)2969	30C	MAC-MTC-7	1812	1688	93.16	1789	1558	87.1	May-62	1771	1542	87.1*	18	1.00	16	1.00
(30-1)2969	30F	MAC-MTC-9	3642	3380	92.80	2990	2604	87.1	May-62	2947	2567	87.1*	43	1.44	37	1.44
(30-1)2969	30G	MAC-MTC-48	2563	2385	93.06	1864	1679	90.1	May-62	1851	1668	90.1*	13	.70	11	.70
(30-1)3007	31B	WCE-MTC-11	673	627	93.1	689	623	90.47	May-62	684	619	90.47*	5	.73	4	.73
(30-1)3007	31D	CMR-MTC-1	14012	2976	21.24	13872	2974	21.44	May-62	13865	2953	21.30	7	.05	21	.71
(30-1)3007	31D	CMR-MTC-3A	30878	28535	92.41	25152	23173	92.15	May-62	25127	23155	92.15	25	.10	23	.10
(30-1)3007	31E	LAB-MTC-9-19	36440	33951	93.17	33164	30825	92.95	June-62	33005	30665	92.91	159	.48	161	.52
2-468	32A	ACE-MTC-3	4094	3815	93.19	4001	3706	92.63	May-62	3978	3683	92.58	23	.57	23	.62
2-468	32B	ACE-MTC-6	8114	2751	33.9	8786	2910	33.12	May-62	8439	2783	32.98	347	3.95	127	4.36
2-468	36A	Pilo Combs				2046	1896	92.67	--	2022	1749	86.52	24	1.17	147	7.75
(30-1)3058	37A-B	SYL-MTC-1	882	821	93.07	827	751	90.78	June-62	824	748	90.78*	3	.36	3	.36
						677534	549[illegible]	81.18		668915	5420[illegible]	81.03	8619	[illegible]	[illegible]	1.444

upgreding when it was disallowed.

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA GEN. REG. NO. 27

UNITED STATES GOVERNMENT

APPENDIX D

Memorandum

TO : Files

DATE: February 7, 1966

FROM : Douglas E. George, Director
Division of Nuclear Materials Management

SUBJECT: MEETING WITH NUMEC - FEBRUARY 3, 1966

On February 3, 1966, D. E. George, S. C. T. McDowell, L. C. Solem, (DNMM), and E. D. Marshall (OR), met with Messrs. Shapiro, Newman, Weber, and Lovett, of NUMEC for the purpose of discussing the findings and recommendations resulting from the DNMM survey made at NUMEC in November 1965.

We explained the purpose of the meeting was to review with NUMEC management the survey findings and recommendations to assure that we had not misrepresented any facts or had not overemphasized unimportant points.

We also called attention to the fact that we were aware that some of the recommendations had already been acted upon by NUMEC, including some aspects that had been underway at the time of the November survey. We asked to be brought up to date on the current status of such actions and requested that NUMEC confirm these actions and provide a schedule indicating when the recommendations would be accomplished. It was recognized that some were obviously recommendations of a continuing nature and thus, in effect, would never be finished.

NUMEC was given a copy of the IBM run of the October 31, 1965 inventory, including a run of the dollar value thereon. They were also provided a copy of the tabulation of the gamma spectrometer data on the filters. We agreed to send a reconciliation of the October 31, 1965 inventory.

NUMEC was then handed copies of three sections of the draft survey report (Sec. 3 - Summary of Findings, Sec. 6 - Discussion of WANL Losses, and Sec. 7 - Recommendations). After they had read these sections, Dr. Shapiro asked that NUMEC personnel be excused from the meeting to discuss the sections among themselves. After slightly more than 2 hours, the meeting reconvened. Dr. Shapiro had a number of editorial suggestions which we accepted, the more important of which included a definition of the word "loss" as a direct part of, or as a footnote to, the summary. We pointed out that "loss" was already defined on the first page of the report, but we would make a special point of referring to that definition in the summary. Dr. Shapiro also requested that the NUMEC letter of December 29, 1965, which discussed in some detail the NUMEC processes and practices and which we used extensively in preparing this report, be attached to the report as an appendix. We agreed to attach the letter. At their request we

also agreed to quote from the letter in our discussion of the WANL losses, rather than to paraphrase and summarize it as we had done.

Dr. Shapiro then went over the attached recommendations as presented. He said he felt they were good recommendations and that a number had been completed, with practically all others being significantly on the road toward completion. Specifically, Dr. Shapiro commented, referring to the recommendations by the same numbers as used in the report:

1. This recommendation is accomplished as is evidenced by the fact that he hired one of the DM&M staff, J. E. Lovett. We agreed that a long step towards accomplishment had been taken, but called his attention to the fact he had made personnel changes in the past and that such change, of itself, without continued personal interest on his part would not assure long-term continued satisfactory performa ce.

2. Dr. Shapiro agreed with the general objective of the six detailed portions of this recommendation and commented as follows:

   a. The general ledger is now in process of being prepared. It will be completed in a few days and will support their January 31, 1966 Material Balance Report to the Oak Ridge Field Office.

   b. The recommended subsidiary ledger is now in use for almost all plant areas and will be completed in the immediate future.

   c. A chart of accounts has been drafted and is expected to be completed and fully in use by the end of February.

   d. Dr. Shapiro agreed with the need of a system of inventory identification, but asked that there be some latitude to achieve the objective in another fashion than as specifically recommended. We agreed and the recommendation has been revised accordingly.

   e. The internal transfer system is now in practice throughout almost all plant areas and will be instituted in those remaining areas in the immediate future.

   f. Internal management reports are now being issued as recommended.

3. Work has begun to accomplish this recommendation. In discussing it Dr. Shapiro noted that this really was a never-ending recommendation.

4. This recommendation resulted in an extensive discussion as NUMEC interpreted it to mean that adjustments would be made to the records regardless of the precision with which an inventory had been taken. I recognized that operating needs of a company for a "ball-park inventory" might result in routine inventories which would produce the operating results required, but which would not have the accuracy needed to adjust the records. On the other hand, I pointed out to Dr. Shapiro that the recommendation was to establish that not less often than annually, a precise inventory would be made. Even here we recognized that a book value for certain portions of an inventory might be a superior number to one obtainable by other methods. After this discussion Dr. Shapiro seemed to understand the thrust of the recommendation and agreed that it would be accomplished; no changes in the recommendation were proposed.

5. NUMEC expects to have a draft procedure manual available for review by Oak Ridge in March 1966.

6. Dr. Shapiro noted that NUMEC was now cleaning up its residues on current jobs with approximately four months lag. Regarding the residues on the WANL job, it was noted that NUMEC had agreed with the Commission that the residues would be processed by November 1966.

7. This recommendation apparently was the cause of the two-hour private meeting. NUMEC expressed a reluctance to adjust their October 31st book inventory to a fixed quantity as was recommended. They requested that the recommendation be revised to adjust the inventory based on recovery data as it became available, noting that recovery would not be complete until November 1966. They also suggested that the recommendation was a departure from the agreement signed in November. I disagreed, stating that the agreement signed in November recognized that NUMEC would be billed for the total amount of U-235 not returned to the AEC and would be given a year in which to (a) recover and return material as an offset to the total bill, and (b) make full payment of any outstanding amount. I stated that I knew of no agreement with NUMEC which would permit the maintenance of an inventory record different from that obtained during the survey.

NUMEC raised a series of questions dealing with the uncertainty of the data, particularly those in the residues. They pointed out that there were quite large individual differences between New Brunswick data and the value carried on the NUMEC books. I pointed out to Dr. Shapiro that I had recognized this and explained that

after applying the analytical results to the parent batch, there was good agreement with the data carried by NUMEC. I recognized that during recovery of the residues the inventory might very well be adjusted upward or downward with a compensating adjustment in the reported loss. I also acknowledged that there might be as much as 5 to 10 kg uncertainty in the residue inventory. However, I pointed out there was no better data available and that the sampling plan used by the AEC had, in my judgment, confirmed the NUMEC inventory quantities for the residues as being reasonable. Therefore, I saw no way to alter the recommendation.

I agreed that if he had additional data that he would like to present, we would be glad to review it and we would make ourselves available at any time. I invited Dr. Shapiro to re-examine his data, re-evaluate his inventory if he felt justified in so-doing, and submit such data to me for review. I also told him that, if necessary, to get to the full and complete truth I would have the residue recovered at Oak Ridge. (I later told Dr. Shapiro that I would have to back up on that offer as I had no authority to commit the AEC to an expenditure of some $50 to $75,000 for this purpose). I asked Dr. Shapiro if he would adjust his inventory records should the residues be recovered or a more extensive sampling plan be used to determine their U-235 content. His answer was that such an adjustment would not necessarily be made because there was still material from the pit which had not been incinerated and evaluated.

I told Dr. Shapiro that I thought there was no further usefulness in discussing this point further; that he should set his views in writing and I would see that they were made a part of the record. I told Dr. Shapiro that I would assure that the survey report clearly reflected that there was an uncertainty in the inventory of these residues and that upon recovery a quantity different from that reported might be found.

8. Dr. Shapiro showed me a draft educational program which I believe is a step in the right direction. He assured us that within a very short period of time all plant personnel would be given training along the lines suggested.

Dr. Shapiro and Jack Newman called me on February 5 to read the letter being sent in response to my request of February 3. This letter states that NUMEC will now (as of February 28, 1966) adjust their inventory to reflect the quantity reported by the AEC survey team. It also reiterates that further adjustments, upward or downward, may be necessary as recovery progresses and that a final adjustment will not be made until recovery is complete on November 23, 1966.

Enclosure
Recommendations of Survey Team

RECOMMENDATIONS EXTRACTED FROM DRAFT SURVEY REPORT (1)

7.0 Recommendations

7.1 To prevent a recurrence of the circumstances which resulted in this survey; to put NUMEC in a position to recognize and to minimize its losses; and, to record and report to the AEC in a timely manner losses and material-unaccounted-for actually being experienced, it is recommended that NUMEC:

1. Give added recognition to its nuclear materials management responsibility by establishing at an appropriate high-level adequate staff to deal with materials management with full support from company management.

2. Take immediate action to:

   a. Install a general ledger to summarize accounts periodically and to support data reported in material balance reports to the AEC.

   b. Develop a subsidiary ledger to account physically for SS material by material balance area and by NUMEC job order number.

   c. Create a chart of accounts (job order numbers) referenced to the project, contract, and purchase order numbers. (The account number itself should identify that the SS material associated with the account is either AEC-contract material or leased material.)

   d. Establish a system of inventory identification by prenumbering process containers. These numbers could then be entered on internal transfer forms and posted to records maintained for the different material balance areas.

   e. Establish an internal transfer system so that internal transfers to and from material balance areas and from one account (job order) to another within the same material balance area are documented with transfer forms and recorded in the subsidiary ledger.

   f. Issue periodically, by material balance areas, a report to NUMEC management of ending inventory and losses which shows and explains losses by job order and the quantity and forms of material physically on hand by job number.

3. Identify and establish the magnitude of all significant loss mechanisms and technical bases thereof. Translate such data to U and U-235 content and record and report on a current basis.

4. Establish inventory procedures and perform plant-wide inventories periodically, but not less often than annually. After comparison of these inventory quantities with the book quantities, record the resulting gain or loss. In establishing plant inventory procedures, NUMEC should not ignore the need to obtain an adequate inventory of in-process material.

5. Establish all control procedures in a procedure manual and submit same to the Oak Ridge field office for review and approval.

6. Process the excessively large quantity of accumulated residues, combustibles, filters, ash, etc., and return the SNM recovered to the AEC. In so doing, care must be exercised to identify and to process residues in such a manner as to permit comparison of recovered values with book values. After such comparison, the resulting gain or loss should be recorded.

7. Adjust the NUMEC October 31, 1965 book inventory to agree with the AEC's October 31, 1965 physical inventory which establishes a U-235 content of 521,197 grams. (A detailed tabulation of the physical inventory has been provided to NUMEC.)

8. Initiate a company-wide educational program stressing the high intrinsic and strategic value of special nuclear material and re-emphasize the health and safety implications of careful handling practices.

(1) These recommendations are as shown to NUMEC on February 3, 1966. Recommendations 2d., 6, and 7 were revised somewhat as a result of that meeting.

APPENDIX E

...lear Materials and Equipment Corporation Apollo, Pennsylvania 15613 Telephone GRover 2-8411 Cable NUMEC

February 5, 1966

Mr. Douglas E. George
Director, Division of Nuclear Materials Management
United States Atomic Energy Commission
Washington, D.C. 20545

Dear Mr. George:

I would like to express our gratitude for your courtesy in coming to Apollo to review with us the summary of your findings and other pertinent data derived from your survey of the special nuclear materials inventory and accountability procedures at NUMEC.

The recommendations contained in your report concerning accountability procedures are clearly sound. They have already been implemented, for the most part, and firm completion dates have been established for all required action. Indeed, in some areas, the remedial action taken or contemplated is over and above the recommendations contained in the report. A brief survey of our activities in this regard follows:

Staff

In recognition of the need for a thoroughly professional and high-level staff to deal with nuclear material management activities, NUMEC has employed Mr. James Lovett, formerly with the Division of Nuclear Materials Management. Mr. Lovett is serving as Manager of the Nuclear Materials Control Department. In this capacity, he is receiving full management support and will be assisted by an adequate staff, in terms of both number and quality. Although we have had several discussions concerning the size and nature of the required staff, Mr. Lovett has not yet decided as to his exact needs. His recommendations, which should be forthcoming shortly, will be promptly implemented.

Records

In regard to the Nuclear Materials Control record system, NUMEC has in process changes which will provide the following basic records:

a. A primary transfer journal with a separate page for each reporting facility with which NUMEC has had material transactions

...primary transfer

C. A contract ledger summarizing all the nuclear materials activities under a given job number.

D. An internal control ledger detailing the physical movement of nuclear materials between material balance areas and between jobs.

E. A general ledger which summarizes data in the other ledgers and journals and which will support data reported to the AEC and to NUMEC customers.

Significant progress has been made in developing all of the foregoing records and in assuring their accuracy. In many instances, this has necessitated the reconstruction of records back to July 1, 1965, the beginning date of the AEC fiscal year. Although this is a lengthy process, important strides have already been made.

The primary transfer journal and contract ledger are complete and in balance. The summary transfer journal is now being reconstructed and will be complete before our next material balance report is issued.

The internal control ledger has been set up. It is complete and in balance for all transactions since January 1, 1966, and for earlier transactions on some contracts as to which reconstruction was either unnecessary or relatively simple. For lack of adequate physical data, the internal control ledger has not yet been brought into balance with NUMEC's other records. As a result of a sustained effort now under way, we expect that the internal control ledger will be 100% complete shortly after NUMEC's next precise physical inventory which is scheduled for June 30, 1966.

The general ledger is now being reconstructed and we expect that it will be a complete and auditable record by March 31, 1966.

In addition to the foregoing records, a draft chart of accounts referenced to project, contract or purchase order numbers, as appropriate, has been completed. A copy of this draft was furnished to you during our February 3 meeting. The final version of this chart will be included in the draft procedures manual, discussed below.

Inventory Identification

NUMEC is investigating alternative systems of container identification which would assure better control of stored materials. It is our [illegible] stored [illegible]

Reports to Management

The Nuclear Materials Control Department will issue, not less than once each month, summary reports to NUMEC management on the status of nuclear materials control. These reports will reflect inventories and losses by materials balance area and explain, insofar as possible, losses experienced in individual job orders. The first such report will be issued as soon as the January 31 inventory data has been completed and reconciled, probably within the next 7-14 days. We have already initiated the practice of regular meetings with management to review and plan nuclear materials control activities.

Identification of Loss Mechanisms

In addition to reporting accurately on the status of inventories and losses, it is vital that loss mechanisms be carefully identified in order to prevent or reduce, insofar as possible, further losses. A major portion of Mr. Lovett's time during January was devoted to the identification and investigation of loss mechanisms with special empahsis on preventative efforts. This will be a major continuing activity of the Nuclear Materials Control Department. As each loss mechanism is identified and a method is developed for determining the quantity of uranium being lost, such data will be recorded and reported on a current basis. The major loss thus far investigated is that of liquid waste discards, and the January material balance report will reflect known liquid waste discards during the month.

Inventories

NUMEC will take "routine" physical inventories at the end of each month and "precise" physical inventories every six months. Apparent losses as reflected by the "routine" inventories will be posted to the NUMEC internal records, and the apparent losses reflected by the "precise" inventories will be used in the preparation of reports to the AEC and to NUMEC customers.

Procedures Manual

NUMEC had previously made a commitment to the Oak Ridge Office that a draft Nuclear Materials Control Procedure Manual would be submitted for review no later than March 1, 1966. While we still consider that the March 1 date is a realistic deadline which can be met, the Nuclear Materials Control Department is at the present time attempting to make a wide variety of changes in NUMEC's nuclear materials control procedures.

We believe that a deadline of March 31, if acceptable to you and to Oak Ridge, would give us the time necessary to make needed changes and to incorporate these changes in the draft procedure manual, thereby reducing the probability that the manual would be significantly out of date before it had been finally approved.

Training

In the belief that effective special nuclear materials control can be achieved only with the cooperation and understanding of all employees, NUMEC has initiated a company-wide educational program in which special emphasis will be placed on the high intrinsic and strategic value of special nuclear materials. You were furnished with a draft outline of one training lecture during our February 3 meeting. The first session in this program will be held on February 7, 1966.

Although we believe that the foregoing improvements will strengthen NUMEC's accountability system, we shall be alert to the need for any additional changes. In this regard, we would, of course, appreciate any further recommendations you may wish to make.

Inventory Adjustment and Materials Recovery

As noted in paragraph 3.17 of your report, NUMEC has a sizeable backlog of internally-generated uranium residues with an unmeasured U-235 content. In addition, as we discussed during our meeting and as recognized in your report, there are uncertainties with respect to the U-235 content of the substantial residues which have been assayed. These uncertainties will, of course, be resolved as NUMEC begins to reprocess these residues for return in accordance with the terms of our provisional financial settlement of November 23, 1965, under WANL Purchase Order 59-NP-12674.

These uncertainties, as we discussed during our meeting, arise out of the heterogenous nature of the above-described residues and can only be resolved, as we agreed, by a sampling plan which is tantamount to full recovery of the materials in question. Accordingly, as we had indicated in our discussion, we believe it would be preferable to stay a final adjustment of our book inventory until full recovery is accomplished, thereby allowing our book inventory to reflect the best and most accurate physical data obtainable. In these circumstances, adjustments to our book inventory would be made as recoveries are effected. A final adjustment would be made by November 23, 1966, the last date on which material may be returned for credit under the terms of the above-mentioned provisional financial settlement with WANL.

Nevertheless, we would be willing, as an interim measure, and in accordance with your recommendation, to adjust our book inventory to accord with the results of the AEC's October 31, 1965 inventory check taken in the course of your safeguards investigation at NUMEC. As the above-mentioned uncertainties are resolved, we would adjust our book inventory to accord with the data so obtained. In these circumstances, an interim book inventory adjustment to accord with the results of your inventory check would be reflected on NUMEC's February 28, 1966 materials balance report.

We believe that, in any event, the ultimate result is identical and, accordingly, we shall abide by your advice and recommendation in this regard.

Again, I would like to express our sincere appreciation for your courtesy in reviewing these matters with us.

Very truly yours,

Zalman M. Shapiro
President

ZMS/nm

REPORT TO

JOINT COMMITTEE ON ATOMIC ENERGY

REVIEW OF

ACCOUNTABILITY CONTROLS GAINED

SPECIAL NUCLEAR MATERIALS

NUCLEAR MATERIALS AND EQUIPMENT CORPORATION

[redacted]

BY

THE COMPTROLLER GENERAL

OF THE UNITED STATES

[redacted]

COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

JUN 2 0 1967

B-157767

Dear Mr. Chairman:

The General Accounting Office has made a review of policies, procedures, and practices of the Atomic Energy Commission and of Nuclear Materials and Equipment Corporation, a Commission licensee, relating to accountability of special nuclear materials. The review was made pursuant to a request made by letter dated September 7, 1966, from the Chairman of the Joint Committee on Atomic Energy. Also, in accordance with this request we have completed similar reviews of two other licensees and plan to report to you in the near future on the results of these reviews.

The Commission has recently made a number of revisions to its program for domestic safeguarding of special nuclear material, and we have been advised that additional actions are planned which have been designed to strengthen the program. We are therefore making no recommendations regarding existing regulations, contracts, and procedures.

The Commission and the licensee have had an opportunity to comment on the matters presented in this report, and their comments have been considered in the report. The licensee's written comments and our evaluation thereof are included as an appendix to the report.

A copy of this report is being sent today to the Vice Chairman of the Joint Committee on Atomic Energy. As agreed to by your staff representatives, we are making copies of this report available to the Commission and to the licensee. We plan to make no further distribution of this report unless copies are specifically requested, and then distribution will be made only after your approval has been obtained or public announcement has been made by you concerning the contents of the report.

Sincerely yours,

Comptroller General
of the United States

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

Contents

REPORT ON REVIEW

OF

ACCOUNTABILITY CONTROLS OVER

SPECIAL NUCLEAR MATERIALS

NUCLEAR MATERIALS AND EQUIPMENT CORPORATION

ATOMIC ENERGY COMMISSION

INTRODUC 'ION

The General Accounting Office has made a review of policies, procedures, and practices of the Atomic Energy Commission and of Nuclear Materials and Equipment Corporation (NUMEC), Apollo, Pennsylvania, relating to accountability of special nuclear materials owned by the Atomic Energy Commission (AEC) and held by NUMEC, an AEC licensee, at its Apollo facility. We did not examine into accountability practices at NUMEC's plutonium facility located at Leechburg, Pennsylvania.

Our review which was made pursuant to a request by the Chairman, Joint Committee on Atomic Energy, dated September 7, 1966, was directed toward an examination of the adequacy of AEC policies, procedures, and practices relating to accountability as they were applied to NUMEC's operations. Also, we examined NUMEC's written accountability procedures, past and current accountability and financial records, and certain production records.

BACKGROUND

During the period from the establishment of the Atomic Energy Commission in 1947 until the enactment of the Atomic Energy Act of 1954 (42 U.S.C. 2011), all special nuclear material in this country was owned by the United States Government and, with certain exceptions, was held by AEC and its cost-type contractors operating Government owned or controlled plants and laboratories. Under these circumstances, AEC, responsible for program direction and contract administration, was in a position to require its cost-type contractors to establish systems for control over special nuclear material.

Therefore, through a body of policies, guides, instructions, and standards, AEC developed a system of control for cost-type contractors, designed to demonstrate, through appropriate measurement and recording of receipts, production, and removals, and through physical inventories, the quantity and location of material on hand at the various facilities. The system was designed to localize, within a given plant, where losses were occurring, in order to provide a basis for investigation and possible corrective action. Additional controls were provided through AEC surveillance activities and personnel and physical security requirements.

One of the purposes of the Atomic Energy Act of 1954 was to provide:

> "*** a program to encourage widespread participation in the development and utilization of atomic energy for peaceful purposes to the maximum extent consistent with the common defense and security and with the health and safety of the public."

From the time of the passage of the 1954 act until the enactment of legislation in 1964 permitting private ownership of special

nuclear material, all such material within or under the jurisdiction of the United States continued to be under mandatory ownership of the United States Government, even though it was more widely held by cost-type and fixed-price-type Government contractors and licensees who were not Government contractors. Since 1964, private ownership of special nuclear material has been permissible. Although very little of this material has yet passed from Government to private ownership, all special nuclear material produced in privately owned nuclear reactors since the 1964 legislative amendment has been privately owned.

In furtherance of the Government's policy concerning the development of atomic energy, the 1954 act authorized, with certain restrictions, the distribution of special nuclear materials under licenses (Section 53). Regulatory authority is provided under section 161 which authorizes AEC to:

> "b. establish by rule, regulation, or order, such standards and instructions to govern the possession and use of special nuclear material, source material, and by-product material as the Commission may deem necessary or desirable to promote the common defense and security or to protect health or to minimize danger to life or property;
>
> * * * * *
>
> "i. prescribe such regulations or orders as it may deem necessary *** (2) to guard against the loss or diversion of any special nuclear material acquired by any person pursuant to section 53 or produced by any person in connection with any activity authorized pursuant to this Act, and to prevent any use or disposition thereof which the Commission may determine to be inimical to the common defense and security, ***."

On April 6, 1955, AEC appr ved, for inclusion in the Code of Federal Regulations, 10 CFR 70. This regulation established the procedures and criteria for issuance of licenses and for the distribution by the Commission of special nuclear material to licensees and the terms and conditions for such distribution. The regulation is directed primarily to the protection of the health and safety of persons working with special nuclear material and of the general public, and provides that licensees maintain records showing the receipt, inventory, and transfer of special nuclear material.

In developing the regulations in 10 CFR 70, AEC considered the question of whether regulatory requirements for accountability and physical security of licensed material should be imposed in addition to the requirements for the protection of health and safety. AEC concluded that the physical protection and accountability controls which licensees, as prudent businessmen, would maintain over special nuclear material because of its intrinsic value and their financial responsibility for its loss or damage and the severe criminal penalties provided by AEC's governing legislation would adequately protect the national interest from the standpoint of unlawful diversion. Therefore, in 1955 a policy was adopted on the basis of this conclusion.

With regard to criminal penalties, the Atomic Energy Act of 1954, as amended, provides that:

> "Sec. 222. VIOLATION OF SPECIFIC SECTIONS.--Whoever willfully violates, attempts to violate, or conspires to violate, any provision of sections 57, 92, or 101, or whoever unlawfully interferes, attempts to interfere, or conspires to interfere with any recapture or entry under section 108, shall, upon conviction thereof, be punished by a

fine of not more than $10,000 or by imprisonment for not more than five years, or both, except that whoever commits such an offense with intent to injure the United States or with intent to secure an advantage to any foreign nation shall, upon conviction thereof, be punished by death or imprisonment for life (but the penalty of death or imprisonment for life may be imposed only upon recommendation of the jury), or by a fine of not more than $20,000 or by imprisonment for not more than twenty years, or both.

"Sec. 223. VIOLATION OF SECTIONS GENERALLY.--Whoever willfully violates, attempts to violate, or conspires to violate, any provision of this Act for which no penalty is specifically provided or of any regulation or order prescribed or issued under section 65 or subsections 161 b., i., or p. shall, upon conviction thereof, be punished by a fine of not more than $5,000 or by imprisonment for not more than two years, or both, except that whoever commits such an offense with intent to injure the United States or with intent to secure an advantage to any foreign nation, shall, upon conviction thereof, be punished by a fine of not more than $20,000 or by imprisonment for not more than twenty years, or both."

In May 1966, after reviewing its policy which was based on the "intrinsic value" concept, AEC concluded that a change should be made in the direction of placing more reliance on positive requirements, with respect to accountability controls over licensees. There was, among the actions taken to strengthen the program since that time, approval by AEC on January 25, 1967, of amendments to 10 CFR 70 which will require certain licensees to establish, maintain and submit to AEC written procedures for the control and accounting for special nuclear material in their possession and to take a physical inventory not less often than annually.

AEC authorized NUMEC to receive and process special nuclear material at its Apollo facility under license number SNM-145. As

an AEC licensee, NUMEC first received material by lease arrangement in December 1957. NUMEC received its first nuclear material as an AEC contractor in August 1959, and since that time has processed nuclear material which was received under lease for commercial work and which was received under various types of contracts and subcontracts with AEC and Government contractors.

NUMEC owns and operates a uranium processing facility at Apollo, Pennsylvania. The major emphasis of the facility is on the conversion of uranium hexafluoride to uranium oxide or carbides and the fabrication thereof into products for use in nuclear reactors, including commercial power, research and governmental applications. The Apollo facility also recovers uranium from various scrap and residue materials commercially and from its internally generated scrap.

NUMEC is not equipped at its Apollo plant to prepare uranium metal but is equipped for most operations involving uranium compounds. Separate processing and fabrication lines are operated for uranium enriched above 5 percent U-235 and for uranium of 5 percent U-235 or less. Also, NUMEC maintains a scrap reprocessing line for uranium of less than 5 percent enrichment which is separate from the line for uranium above 5 percent enrichment.

Over the years, NUMEC has had significant amounts of special nuclear materials under its control. NUMEC and AEC records show that NUMEC's receipts and shipments of special nuclear materials from start-up through December 31, 1966, amounted to about 21,750 kilograms U-235 and 19,865 kilograms U-235 respectively. NUMEC reported losses during this period amounting to about 260 kilograms U-235, or about 1.2 percent of total receipts, and an ending inventory at December 31, 1966 of about 1,625 kilograms U-235 with a value of about $19.5 million.

During its investigations of NUMEC's loss experience, AEC has noted that NUMEC performed a diversity of processes in its uranium operations, some of which were unique and had been untried commercially. On one "first of a kind contract" where a large loss was experienced, NUMEC described its operation as "an extremely dirty and dusty process." The difficulty of this job was confirmed by an official of Westinghouse Electric Corporation, the Government contractor; he advised AEC that there was insufficient experience with this type of process, none which was really comparable, on which to evaluate NUMEC's processing experience.

A list of the current principal officials of the Atomic Energy Commission responsible for the administration of activities discussed in this report is shown below.

	Tenure of office	
	From	To
Chairman:		
Glenn T. Seaborg	Mar. 1961	Present
Operating and Promotional Functions		
General Manager:		
R. E. Hollingsworth	Aug. 1964	Present
Assistant General Manager for Administration:		
John V. Vinciguerra	May 1966	Present
Licensing and Regulatory Functions		
Director of Regulation:		
Harold L. Price	Sept. 1961	Present

COMMENTS ON ACCOUNTABILITY CONTROLS OVER AEC-OWNED SPECIAL NUCLEAR MATERIALS FURNISHED TO NUMEC

The Commission in 1955 concluded that the accountability controls which licensees, as prudent businessmen, would exercise over special nuclear material because of its intrinsic value and their financial responsibility for its loss or damage and the criminal penalties provided by AEC's governing legislation would adequately protect the Government's interest. In our opinion, the problems regarding accountability of special nuclear materials at NUMEC relate directly to this policy and to the control mechanisms established to carry out the policy.

Under the Atomic Energy Act of 1954, as amended, AEC is authorized to prescribe such regulations or orders as it may deem necessary to guard against loss of special nuclear material. NUMEC's past procedures and practices for the accountability of special nuclear material were not sufficiently adequate to identify losses of uranium with specific jobs or process areas or with the period of time in which such losses occurred. Although NUMEC made periodic physical inventories and AEC performed a number of accountability surveys, a significant quantity of enriched uranium could not be accounted for in the spring of 1965 when NUMEC prepared to close out a large contract.

Because of the condition of NUMEC's records, we were similarly unable to identify the specific disposition of this material. AEC has stated that, although it could not be stated with certainty that diversion had not taken place, no evidence had been found to support the possibility of diversion and that other information did exist to reduce such possibility.

Considering the importance of having a reliable and accurate accounting of the use of special nuclear materials, we believe that, with regard to NUMEC, AEC has utilized its authority for control of such materials in a manner that has been less than clearly effective. Also, it appears to have been incumbent on NUMEC to ensure the effective implementation of system improvements, since, on the basis of the record, it should have been evident to NUMEC that its system was not providing a current and accurate accountability for the special nuclear materials for which it was responsible.

Although general guidance was provided by AEC in the form of recommendations or suggestions, we noted an absence of definitive standards to direct NUMEC in the formulation of an acceptable materials control system. AEC surveys over the years have repeatedly identified a need for improvements to NUMEC's materials control system, and, at various intervals, have resulted in concern as to the adequacy of NUMEC's controls over special nuclear materials. For the most part, in consistence with its policy, AEC has attempted to obtain improvements in NUMEC's system through encouragement and suggestions, rather than by more aggressive efforts to ensure the existence of an accurate and reliable materials control system.

In connection with this, AEC, in establishing its policy in 1955, noted that, if the policy proved inadequate, other means of ensuring adequate protection would be considered. Considering the concern evidenced at times by AEC, we feel that "other means," such as the institution of a resident inspection system at NUMEC, to provide assurance that an effective accountability system was being maintained and material was being adequately safeguarded, would have been appropriate.

AEC records indicate that NUMEC has generally responded to suggestions made as a result of the surveys. It appears, however, that NUMEC did not exert the sustained effort necessary to effect and maintain the accountability system improvements necessary for the localization and timely detection of losses. As late as November 1965, AEC reported that its survey of NUMEC records confirmed the findings of prior surveys that the records which purport to control internal movement of material were incomplete and inadequate.

With respect to the current situation at NUMEC, our review showed that, in the past year, NUMEC has made relatively significant progress in the development of a sound accountability system. We noted that improvements are still necessary in the area of localization and timely detection of losses. Also, on the basis of its most recent survey, AEC has yet to be satisfied as to the adequacy of the implementation of NUMEC's system.

By letter dated January 25, 1967, NUMEC advised AEC of the actions that had been and were being taken to comply with recommendations in AEC's most recent survey report, and NUMEC proposed March 31, 1967, as the date for a physical inventory of special nuclear material at NUMEC. By letter dated February 10, 1967, ORO advised NUMEC that it would observe the taking of the March 31, 1967, physical inventory and would conduct a survey and submitted for NUMEC's consideration a survey plan summary which had been developed by ORO as a means of arriving at a mutual understanding of the survey plans.

We were subsequently advised that, by mutual agreement between AEC and NUMEC, the survey was delayed until April 30, 1967, because it was expected that by that time the uranium inventory would have been reduced and a more accurate physical inventory could be taken. After considering the history of this case, we

expressed the view to NUMEC and AEC that this survey should be utilized as a basis for developing a mutual understanding and agreement on AEC requirements and for establishing jointly a fully acceptable materials control system on a timely basis.

We were subsequently advised by AEC that its planned April 30, 1967, inventory verification had been postponed because of the condition of NUMEC's uranium inventory. NUMEC had advised AEC that approximately half of its uranium inventory was in scrap residues.

NUMEC proceeded with its physical inventory on April 30, 1967, and so advised AEC during a meeting on May 4, 1967. We were informed that it had been agreed during the meeting that NUMEC provide AEC with (1) a detailed description of the steps it used to take the inventory, (2) all sampling, analytical, and other measurement data obtained from the physical inventory and NUMEC's interpretation of such data, and (3) NUMEC's statement of its April 30, 1967, inventory. We were further informed that an AEC survey team had arrived at NUMEC on May 10, 1967, to review the current situation.

AEC REGULATIONS AND PROCEDURES RELATING TO CONTROL OF SPECIAL NUCLEAR MATERIALS BY LICENSEES

AEC's principal regulations applicable to the issuance of licenses for handling special nuclear material are set forth in 10 CFR 70, "Special Nuclear Material," and 10 CFR 20, "Standards for Protection Against Radiation." These regulations are directed primarily to protection of the health and safety of persons working with radioactive material and of the general public and provide that licensees maintain records showing the receipt, inventory, and transfer of special nuclear material.

Under the provisions of the Atomic Energy Act of 1954, as amended, AEC is authorized under Section 53 to issue licenses and to distribute special nuclear material to licensees by sale, lease, or grant. Material distributed to lessees under this provision is generally referred to as Section 53 material. The act also provides that the Commission may make a reasonable use charge for material distributed by lease under Section 53. The act does not require a license for special nuclear material to be held under contract with and for the account of the Commission.

Material so held is generally referred to as non-Section 53 material. However, non-Section 53 material may also be held under a Section 53 license when there are circumstances in which the exemption from licensing is not applicable. Thus the same facility might hold at the same time Section 53 material under a Section 53 license, non-Section 53 material under a Section 53 license, and non-Section 53 material under a contract with and for the account of the Commission.

In developing the regulations in 10 CFR 70, approved in 1955, AEC considered the question of whether regulatory requirements for

accountability and physical security of licensed material should be imposed in addition to the requirement for the protection of health and safety. AEC concluded that the physical protection and accountability controls which licensees, as prudent businessmen, would maintain over special nuclear material because of its intrinsic value and their financial responsibility for its loss or damage and the severe criminal penalties provided by AEC's governing legislation would adequately protect the national interest from the standpoint of unlawful diversion.

With respect to accountability, AEC subsequently added provisions to part 70, requiring licensees to submit material transfer reports and periodic material status reports to AEC on forms prescribed by AEC. AEC's procedures provided that the material transfer forms be signed by both the shipper and the receiver to show agreement as to the data recorded. The shipper and receiver must resolve any differences or submit the matter to a referee for settlement.

During the early years of the program, Section 53 material was distributed to licensees under individual lease agreements. Effective May 1, 1960, AEC established a standard "Lease Agreement" for the distribution of Section 53 material. Terms of this agreement included, among other pertinent clauses, a provision that the lessee:

1. Have full financial responsibility for the consumption and loss of materials and for payment of use charges and services as applicable.

2. Submit to AEC transfer documents covering receipts and shipments of material and reports of losses and inventory.

3. Maintain and make available, for AEC inspection, adequate records pertaining to the receipt, possession, transfer, or use of material subject to the lease.

The agreement was revised July 1, 1963, to further provide that the lessee take at least one physical inventory a year and use his best efforts to segregate special nuclear material subject to the lease from any other nuclear material in his possession.

In addition to using the lease arrangements, AEC has over the years contracted with private industry for work related to AEC programs. As discussed previously, the Atomic Energy Act of 1954 provides that contractors holding special nuclear material "with and for the account of the Commission" can be exempted from licensing. AEC field offices and their prime contractors entered into contracts and subcontracts with licensed and nonlicensed facilities, which provided for the furnishing of the material as non-Section 53 material.

Originally, the terms of these contracts and subcontracts, which were for the most part fixed-price, differed from the terms of the Lease Agreement in that they generally did not provide for full financial responsibility or for the payment of use charges. In recent years, however, full financial responsibility has generally been required. Material transfer forms and periodic material balance reports are required by holders of non-Section 53 material.

Under fixed-price contracts, involving the use of non-Section 53 material, accountability and safeguards requirements existed to the extent that such requirements were contained in the contracts. We were informed that the provisions among different contracts varied considerably in this regard. To minimize the resulting problems, in September 1962 AEC issued instructions to field offices providing for the use of uniform terms and conditions

to be employed to the "maximum feasible extent" by the AEC and its cost-type contractors in connection with the furnishing of non-Section 53 material under fixed-price contracts involving the use of special nuclear material.

These uniform terms and conditions were generally similar to those set forth in the Lease Agreement. However, the uniform contract terms and conditions, unlike those of the Lease Agreement, specifically require the contractor to physically segregate material subject to the contract from other material in the contractor's possession and prohibit the blending of materials, unless the parties otherwise agree, and do not require the payment of a use charge.

Licensees who had cost-type contracts were subject to such accountability and safeguards requirements as might be established by the cognizant AEC field office. In these cases the field offices had AEC Headquarters' guidelines relating to accountability systems as well as their own experience with AEC's operating contractors for guidance in establishing requirements.

In addition to using the above lease and contracting arrangements, on July 22, 1964, AEC adopted the use of a standard Supply Agreement which followed closely the terms and conditions of the Lease Agreement. The Supply Agreement is for use in supplying non-Section 53 enriched uranium to contractors for use under AEC fixed-price contracts.

Although NUMEC is licensed and has held material under a lease agreement, the predominant quantities of special nuclear material held by NUMEC have been furnished under various fixed-price contracts either directly with AEC or under subcontract with Government contractors. Therefore, under the fixed-price contracts, NUMEC has been subject to the accountability provisions of each

contract, as well as to the requirements in the license and the regulations.

AEC maintains records concerning all Government-owned special nuclear material. Further, all special nuclear material licensees, except for a few which possess negligible quantities of material, are subject to periodic on-site accountability surveys under the terms of the regulations, the license, an AEC contract, or a lease agreement. The surveys were designed primarily to protect the proprietary interest of AEC, and they also provided a measure of protection against loss or unlawful diversion.

Criteria and procedures for conducting proprietary accountability surveys are in AEC Immediate Action Directive (IAD) 7400-4, "Surveys of Leased SS Material," dated May 12, 1962, and IAD 7400-8, "Surveys of Fixed Price Contractor and Subcontractor Facilities," dated July 18, 1963. The purpose of such surveys is to obtain an independent opinion on the validity of the data reported.[1] Each survey is to include an audit of the material records, a review of internal control measures, and independent verification of the special nuclear material inventory, including the element and isotopic content. Although general guidance was provided by AEC Headquarters, the specific procedures that were to be applied in carrying out the surveys were largely left to the discretion of the operations offices responsible for making the surveys.

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[1] In consistence with the determination to strengthen controls over special nuclear material in the hands of licensees, AEC by IAD 7402-11 dated April 5, 1966, provided for the expansion of the scope of surveys of special nuclear material, held under lease and under fixed-price contracts and subcontracts, to include a determination of the quantities and the probable causes of process losses, accidental losses, wastes, write-offs, and material unaccounted for, and an evaluation of the significance of these quantities.

In consistence with its philosophy of relying on the intrinsic value concept and severe criminal penalties for unlawful diversion, AEC did not promulgate to licensees specific criteria or standards of performance by which AEC would evaluate the licensees' operations. AEC had adopted the view that prudent business, having its own money invested, would take all necessary actions to ensure that its assets were appropriately known and utilized for the purposes acquired. In consistence with this philosophy, on the matter of licensee accountability surveys, a document prepared by the Division of Nuclear Materials Management and forwarded to field offices in January 1966 provided in part:

> "The opinions of the survey team may be affected by the type facility being surveyed. At an AEC-owned and controlled facility, inventory control deviations might not be permitted that could be tolerated at a fixed-price contract facility where the [licensee] is financially responsible for the material. At a fixed-price facility or a facility having leased material, the survey team may find itself in the position where overall control is adequate but some areas need improvement. Unless the survey team can demonstrate loss of control or other violation of contractual terms and conditions the facility may take the position that changes and improvements in the control system are not required or needed. However, the survey team may suggest changes that would improve control and at the same time assist the facility to reduce effort or provide more useful data. Also, at facilities other than cost-type contractors opinions, recommendations, and suggestions regarding inventory management are not appropriate."

CHRONOLOGICAL DESCRIPTION OF AEC
SURVEYS OF NUMEC'S APOLLO FACILITY

The New York Operations Office (NYO) performed the initial accountability survey of the Apollo plant in September 1960. In a letter dated October 26, 1960, the Director, Technical Services Division, NYO advised NUMEC that:

> "I am disturbed by the report of the survey made by our SS Nuclear Materials Management group of your plant, September 26-30, 1960. The report indicates that you did not have adequate control over the nuclear material, both licensed [Section 53] and accountable [non-Section 53], held at your site."

The letter thereafter enumerated a number of "suggestions and comments" regarding the need to establish responsibility for controls by material balance area, to maintain records to show the material inventory in each area, to improve inventory taking, and to improve weighing and labeling practices.

NYO, in concluding the letter, advised NUMEC that, because of the excellent cooperation received from NUMEC's staff in seeking to establish nuclear material control, the survey would be set aside and another survey would be mad early in the spring of 1961. It was stated that, at that time, NUMEC would be expected to have established workable procedures that would meet AEC standards. In this connection, NYO did not advise NUMEC, except by virtue of its suggestions and comments noted above, of the standards by which NUMEC procedures would be evaluated; the standards were those developed to apply primarily to AEC cost-type contractors.

By letter dated May 12, 1961, NYO advised NUMEC that it had completed its second survey of NUMEC and that its review had been made in accordance with principles intended primarily to govern operations of cost-type contractors. In a summary paragraph, the Director, Technical Services Division, NYO advised NUMEC:

"I am pleased with the great improvement in your operations since our earlier review last September. The comments made in my letter to you dated October 26, 1960 have been acted upon and implemented by your staff. As a result of the current survey, I find that NUMEC meets the AEC requirements for nuclear material accountability."

The letter also made several suggestions to assist NUMEC in its nuclear material control, which concerned the need for a current procedures manual, records for material controls, better weighing and labeling practices, and the need to recover uranium from waste on a more current basis.

During the period from May to August 1962, the AEC Headquarters staff, with assistance from NYO, performed a survey at NUMEC. In its survey report, which was not provided to NUMEC, AEC stated that NUMEC's system of internal control was extremely limited and did not provide a degree of control sufficient to meet AEC standards required for contractors of AEC-owned facilities. The report cited the following matters, among others, which were of concern to the survey team:

1. Losses could not be localized to specific process areas.
2. Ledgers were incomplete.
3. Records did not support monthly material balance reports.
4. A sizable backlog of internally generated uranium residues existed, much of which were not readily identifiable by contract and were stored without an assigned uranium content.
5. Physical inventories were not scheduled on a routine basis; no inventory had been taken between March 1961 and May 1962.

The survey report was reviewed in draft form by NYO. One of the more pointed comments by NYO was that Headquarters' criticism of NUMEC's internal control system appeared to be based upon AEC standards for contractor operation of AEC facilities under

cost-type contracts. NYO stated that it would be more meaningful to compare the internal control system "with that of generally accepted business standards." The precise significance that could be attached to this suggestion is not readily apparent inasmuch as such standards, as they relate to special nuclear materials, were, to our knowledge, nonexistent. The second facet appropriate for consideration is that the operations office, in conducting its survey made in 1961, in order to make the evaluation of NUMEC's activities, used the AEC standards intended primarily for its cost-type contractors.

AEC did not formally advise NUMEC of the results of the 1962 survey until October 26, 1962. For the interim, AEC records show that in a meeting early in October 1962, the Director, Division of Nuclear Materials Management (DNMM), informed a NUMEC official that he "was quite concerned over the situation which existed at NUMEC" and advised him of the principal corrective actions considered necessary.

The Oak Ridge Operations Office (ORO) had been made responsible for reviewing NUMEC activities effective June 30, 1962. Prior to the aforementioned October meeting, the Director, DNMM, forwarded the report to ORO for appropriate action. In transmitting the report, the Director advised ORO that the survey indicated that little further improvement seemed to have taken place since the 1961 survey and that "*** in fact, we suspect there has been retrogression." The Director also stated that the findings had been discussed with NUMEC but that no recommendations had been made by AEC.

In a letter dated October 26, 1962, communicating the Headquarters survey results to NUMEC, ORO stated:

"The recent survey of nuclear materials management *** disclosed a number of points which, if corrected by you, would improve your knowledge and control of special nuclear materials within your plant.

"It is suggested that your internal control system should be based on data developed during processing which would thus provide current and accurate information readily disclosing all special nuclear material physically on hand and all losses as they occur."

ORO suggested specific actions, including suggestions to install a general ledger to summarize accounts monthly and annually, maintain transfer journals currently, develop a subsidiary ledger to account for special nuclear material by job and by material balance area, establish control over internal transfer documents, and take periodic physical inventories and record the results thereof.

NUMEC responded in November 1962, advising ORO that a complete system of internal checks was being incorporated and that the functions of maintaining control records were being separated from the physical accountability functions.

On February 7, 1963, two AEC representatives visited NUMEC to review the progress made by NUMEC toward accomplishing the suggestions made in October 1962. On the basis of the representatives observations during this 1-day visit, ORO, by letter dated April 18, 1963, informed NUMEC:

"In view of the significant progress already made, and the work currently underway to achieve all of the objectives, we consider the performance to date as very commendable."

In July and August 1963, a detailed survey was made by ORO. The report prepared on this survey did not state the basis or standards which were used in performing the evaluation of NUMEC's controls over special nuclear materials. By letter dated July 12, 1963, ORO rejected NUMEC's June 30, 1963, inventory. NUMEC

reweighed certain inventory items at the suggestion of ORO, and was advised on September 23, 1963, that the June 30, 1963, inventory had been presented fairly. ORO also advised NUMEC that external material movements had been reasonably well controlled but that internal transactions reflecting movements of material within the plant apparently had been insufficiently documented and that the inventory as recorded in NUMEC's books had not been adjusted to reflect the results of the physical inventory.

In addition, ORO commented that there was a need for periodic reconciliation between the ledgers and the actual operating results. ORO stated that "it is strongly suggested" that, in order to have acceptable record support for the monthly material balance report, entries to the accountability records be supported by written documents and that transfers of material between jobs be avoided when the contracts specify that no commingling is to occur. ORO also stated that there was a general need for more expeditious closing of contracts, including proper disposition of residues.

ORO stated in its letter of September 23, 1963, that these matters were presented as suggestions for improvement of material management and the records thereof. A NUMEC record of a telephone conversation between ORO and NUMEC officials, in November 1963, showed that ORO officials indicated that they were satisfied that NUMEC was making a good effort toward improving its procedures.

In February 1964, ORO conducted a review of all special nuclear material held by NUMEC under scrap recovery contracts. By letter dated April 1, 1964, NUMEC was advised that its internal control procedures were inadequate. The physical inventory by ORO disclosed more uranium than NUMEC was accountable for under some contracts. ORO noted in its letter that containers of uranium were

not properly labeled, that NUMEC was mixing uranium from several contracts which prohibited commingling, and that NUMEC was not submitting complete and factual material balance reports to AEC.

ORO's letter contained the following comments pertinent to its findings:

> "If Jar No. 1271-2 was mis-labeled and the contained U_3O_8 is [NUMEC job no.] 4A051 material, then NUMEC has violated the recovery contract by (1) not informing this office when the material was processed, (2) by failing to dispatch samples to NBL for analysis, and (3) by failing to furnish batch weights and certified analyses for the dissolver solutions. A further violation of the contract was evidenced by NUMEC's mixing of uranium from several recovery contracts which prohibit commingling. This was brought to our attention by NUMEC's letter of March 16, 1964. We accept NUMEC's explanation that Container No. 1271-2 was mis-labeled and should be identified with Job. No. 4A051, however, since you have failed to furnish us with samples and dissolution data as required by the contract, we are establishing your financial responsibility for Job No. 4A051 at 3,106 grams of 92% enriched uranium, which is the quantity of highly enriched uranium found during our inventory, and 5,368 grams of 2.6% enriched uranium, which is the quantity of low enriched uranium for which you are responsible according to our records."
>
> * * * * *
>
> "Several containers of uranium were observed during the inventory which bore labels identifying the material as uranium assigned to NUMEC Account No. N-0426. This internal account is not being reported in NUMEC's Material Balance Report although we understand that a substantial quantity of uranium is being carried under it.
>
> "We have been advised that Account No. N-0426 contains lab. wastes, residues, and samples from lease accounts, whereas, another account Job No. N-04CPR28, is for station material. This differs with previous statements concerning N-0426 given the AEC Headquarters staff during the their audit of May-August 1962. We think it imperative

that, in order to clear up this apparent discrepancy, you give us a statement of your policy relative to entering material into internal accounts.

"The fact that NUMEC is maintaining internal accounts such as Job Nos. N-0426 and N-04CPR28 without our being informed of the transfers made into and out of the accounts is inconsistent with acceptable SS accounting procedures. You are hereby instructed to report these accounts in your Monthly Material Balance Report and to reflect any movement of material associated with these accounts.

ORO advised NUMEC that:

"In conclusion, the results of the subject Oak Ridge inventory confirm the opinion expressed in previous correspondence relating to other SS material surveys that NUMEC's internal control procedures are inadequate. The possession of more uranium than NUMEC is accountable for under some [scrap recovery] contracts casts doubt on the adequacy of the sampling and/or compositing techniques employed for certain types of scrap.

"We intend to visit your plant again in the very near future. We suggest that you take steps during the interim to correct the procedural inadequacies noted above. Failure to comply with acceptable scrap processing and special nuclear material accounting procedures may require the AEC to take appropriate action including that which would preclude your receipt and processing of special nuclear materials."

NUMEC's president replied to the AEC letter on April 28, 1964, and stated that NUMEC had a new accountability representative. He further advised that:

"We are currently undergoing a thorough review of NUMEC's accountability procedures and books and are trying to reconcile the records with which [the former accountability representative] left us. I shall report to you in detail upon completion of this review. In the meantime, I would greatly appreciate your patience so that we can dig into the matters discussed in your letter of April 1."

In a letter to us dated January 18, 1967, commenting on this survey, NUMEC stated in part:

"A careful review of the 1964 survey results as transmitted to NUMEC indicates that the underlying deficiency was the inability of the system to identify scrap material adequately by contract. In order to understand the significance of this finding it is necessary to have some appreciation of scrap recovery operations at NUMEC.

"NUMEC has undertaken, and continues to undertake, major first-of-a-kind jobs. Such developmental work generally results in low product yields with concomitant high scrap residues. During the period in question, there was a large amount of internally-generated scrap. Additionally, NUMEC was performing commercial scrap recovery operations on a large number of contracts, many of which involved less than 1 kg of uranium. NUMEC's scrap recovery facilities, as a practical matter, had to be operated in a continuous fashion to maintain system equilibrium. With material from different contracts entering the system on a 'heel to toe' basis, actual segregation of material by contract was physically and economically impracticable, if not impossible. It should be noted that scrap material was assayed by contract after dissolution but prior to processing and that recovered material and losses were allocated by contract to the best of our ability. The difficulty, however, in adequately identifying material by contract without total physical segregation is apparent. This is not to say that attempts could not and were not made to identify scrap by contract, but only that such identification was necessarily imprecise. This problem has received increasing recognition by AEC in recent years. Thus, for example, AEC now permits commingling of scrap after dissolution and establishment of accountability under scrap recovery contracts without prior approval. Indeed, the general direction of current accountability procedures is away from accountability by contract. (See, for example, the current Uranium Supply Agreement.) Understood in the context of current standards and requirements, it is clear that the findings of the April 1964 survey do not reflect a determination by AEC that NUMEC's system was inadequate to assure the proper safeguarding of special nuclear material."

Notwithstanding NUMEC's conclusions as to the seriousness of the findings when considered in the context of today's requirements, the survey team was of the opinion that NUMEC had expended insufficient thought and effort in the interests of establishing an acceptable and realistic accounting structure for the recording and reporting of "SS materials." Moreover, in our opinion, AEC's letter of April 1, 1964, evidenced serious concern over the adequacy of NUMEC's then existing accountability practices as they related to the scrap recovery operations.

ORO completed a physical inventory of special nuclear materials at NUMEC in September 1964. NUMEC was advised on October 15, 1964, that crossover of material between jobs had occurred but that, because the audit phase of the survey was delayed pursuant to NUMEC's request, ORO was not in a position to state the extent to which such actions were contrary to the provisions of the contracts for these jobs. ORO also advised NUMEC that the percent of material unaccounted for (MUF), shown by comparing the adjusted book inventory with the physical inventory, was in excess of that which was acceptable to AEC.

ORO's workpapers show that the largest single MUF figure related to NUMEC's contract with the Westinghouse Astronuclear Laboratory (WANL), a major subcontractor of the Government in the nuclear engine for rocket vehicle application program. The figures as presented in the workpapers showed the following:

	Grams of uranium
Adjusted book inventory	274,248
Physical inventory	185,809
MUF	88,439

ORO advised NUMEC that it was recognized that the physical inventory was undertaken while the processing of nuclear materials continued and that NUMEC might be able to readily dispose of a sufficient number of discrepancies to inform ORO, in the very near future, that the accounts were in condition for audit.

AEC records show that, in November 1964, the survey was postponed for an additional 30 days, in accordance with a telephone conversation between ORO and NUMEC, to allow a new accountability representative to assume and become familiar with his duties. The following month ORO and NUMEC officials agreed by telephone that the lapse of time precluded orderly completion of the survey and it was canceled. ORO planned to schedule a new survey in February or March 1965.

The planned survey was delayed, apparently because of circumstances which developed in the closing of the aforementioned WANL contract; this is discussed in another section of the report. In April and May 1965, a survey was made which included a physical inventory verification. By letter dated June 17, 1965, ORO advised NUMEC:

> "Our physical inventory verification at your facility, inclusive of listing, weighing, sampling, and ledger comparisons, has proven acceptable. A formal survey report containing certification that your SS material accounts are valid for all material types with expected and reasonable limits of uncertainty, will be forwarded to you in the near future.
>
> "In the meantime, please consider this letter as notification that our IBM listing of your facility inventory, a copy of which was furnished to you at an earlier date, is acceptable to the AEC."

AEC's physical inventory verification had disclosed a loss of 53 kilograms U-235 on the WANL contract; which indicated a

financial liability on NUMEC's part of about $735,000. In reply to the June 17, 1965, letter, NUMEC advised ORO on July 2, 1965 that:

> "In the referenced letter you requested that we notify you as to the acceptability of your IBM listing of our facility inventory. We cannot accept your IBM listing as fully representative of our facility inventory; for example, it fails to include the enriched material contained in wastes such as the pre and absolute filters we have in storage. As you know, we have approximately 700 such filters which we feel contain a substantial quantity of enriched material held under our WANL Contract 59-NP-12674. In view of this, and before we can accept your inventory listing, we feel that due credit should be given to this inventory item.
>
> "Also, it is our position that, due to the complexity and extreme cost of establishing an accurate inventory value on the material in these filters, the number assigned be the difference between receipts and shipments under the WANL Contract. As this material is reprocessed to the point where it may be assayed accurately, our books would be adjusted to reflect the new inventory."

This approach was not acceptable to ORO. In August 1965, ORO transmitted to NUMEC separate reports on the surveys covering materials obtained under lease agreement for commercial work and materials related to contracts for Government work. ORO expressed the opinion, in one report, that safeguards control of special nuclear materials at NUMEC was inadequate and, in the other report, that such control was less than adequate. In the report related to material held under contracts for Government work, ORO stated that this opinion was based on the following facts:

> "(1) Book physical inventory differences of U-235 developed as a result of the AEC physical inventory are excessive.

"(2) NUMEC refused to accept the AEC physical inventory and failed to provide an adequate physical inventory listing in lieu thereof.

"(3) SS material has been transferred between jobs without approval of the contracting officers.

"(4) Internal accounts maintained for recovery of residues have not been reported to the AEC."

Recommendations to improve specific control procedures were made in each report.

After a follow-up review to determine the status of matters noted in the April-May survey, ORO reported in October 1965 that NUMEC was in the process of investigating the contents of two burial pits for material that might have been inadvertently discarded and buried as unrecoverable waste to determine how much of the difference between the book inventories and the physical inventories on the WANL contract could be accounted for by this material.

The records show that, in each of the years 1961, 1962, and 1963, NUMEC made burials of contaminated wastes, apparently in the belief that the wastes contained insignificant amounts of uranium. AEC records indicate that NUMEC recognized that unacceptably high uranium losses were occurring in 1964 and that the company concluded that previous estimates of uranium in combustible wastes being buried were low. The records show that the 1962 and 1963 burial pits were exhumed in the fall of 1965 and that the recovery operations were witnessed by AEC personnel from several divisions and offices.

The ORO October status report states that the "1962 pit" had been opened and the contents of some drums had been handpicked for evaluation of uranium content and for determination as to its

recoverability. A group of drums of sludge from this pit reportedly had been sampled, analyzed, and shown to be of low uranium content.

A later report on the burials showed that soil samples taken from the 1963 burial pit indicated a U-235 concentration of about 2 parts per million to a depth of about ten inches below the bottom of the pit and the report contained an estimate that the U-235 content was about 2.2 kilograms.

According to NUMEC records, about 7.4 kilograms U-235 were ultimately recovered from the burial pits and subsequently returned to AEC for credit to the WANL contract.

On September 9 and 10, 1965, an ORO representative discussed in detail with NUMEC officials the status of the recommendations made by ORO in the survey reports. On the basis of the 2-day review, a status report, dated October 13, 1965, was issued which stated that the report dealt with changes made or finished since April 30, 1965--the cutoff date for the survey which formed the basis for the two August reports. The report also stated that the review of September 9 and 10, 1965, was not a quantitative audit in depth to determine the accuracy of the records presented, but was rather a qualitative review to determine the extent and coherency of the internal control records system. The report transmitted by ORO to NUMEC on October 14, 1965, presented the following summary opinion:

> "Based on the subject review of September 9-10, 1965, it is our opinion that the nuclear materials control system as currently constituted and operating at NUMEC, is <u>capable of generating</u> a satisfactory material control and safeguards report for nuclear material now being handled by NUMEC." (Underscoring supplied.)

The report also stated that the safeguards problem noted in one of the August reports still existed because the excessive difference between the NUMEC book inventory and the AEC physical inventory of the WANL job still existed. It was pointed out that this difference would be resolved as part of the settlement and closeout negotiations of the WANL contract, which would be reported separately.

A survey of NUMEC's controls was conducted by the AEC Headquarters staff, assisted by ORO and NYO personnel, in November 1965. The objectives of this survey were (1) to determine the total cumulative U-235 loss for NUMEC since plant start-up in 1957 and to evaluate the extent to which such losses could be accounted for in terms of known loss mechanisms, such as accidental losses, discharges into tanks, sewers, etc., and other known removals and (2) to attempt to find explanations for the unexpectedly high U-235 loss which was attributed by NUMEC to be material related to the WANL purchase order.

The report stated that the survey was performed in accordance with the standards intended to cover the operations of contractors functioning under cost-type contracts. As a footnote, the report stated that, normally, special nuclear material held by a fixed-price contractor (such as NUMEC) that was financially liable to AEC for payment of losses "*** would not have been subjected to such an intensive scrutiny; ***"; rather the survey would have followed the standards set forth in an AEC directive, IAD 7400-8. This directive included instructions for the determination of the accuracy of losses and/or consumption reported by material holders but did not provide for the evaluation of the causes, magnitude, and reasonableness of losses.

The report stated that, on the basis of the survey team's findings, the total cumulative loss was established at 178 kilograms U-235 as of October 31, 1965. According to the report, the inventory contained estimates of uranium in residues which were not amenable to representative sampling; therefore, the loss figure was subject to some adjustment either upward or downward upon recovery of this uranium. The report stated that, on the basis of NUMEC's records, it was possible to support a loss through known loss mechanisms of 84.2 kilograms U-235. Deduction of this amount resulted in a total of 93.8 kilograms U-235 unaccounted for since plant start-up. The report also stated that the audit of NUMEC's records confirmed the findings of prior surveys that records which purport to control internal movements of material were incomplete and inadequate; therefore, it was not possible to identify, with a high degree of accuracy, the true physical losses which were attributable to any given contract.

NUMEC did not receive a copy of the final survey report. On February 3, 1966, however, the Director, DNMM, and other AEC officials visited NUMEC and discussed the findings and proposed recommendations of the report. By letter dated February 5, 1966, NUMEC advised AEC that it considered the AEC suggestions made at the meeting to be clearly sound and pointed out the actions that had been and were being taken to implement them. On April 6, 1966, AEC submitted to NUMEC a copy of the recommendations as incorporated in the survey report. On April 22, 1966, NUMEC advised AEC of the status of its efforts to accomplish the needed improvements outlined by AEC.

From June 23 through 25, 1966, AEC officials visited NUMEC to review the progress made by it toward implementing the recommendations. The AEC officials also observed the procedures and

practices being applied by NUMEC in connection with a physical inventory that it was conducting on June 25. According to AEC records, the AEC officials concluded that, in general, NUMEC had made satisfactory progress in implementing the survey recommendations and in ensuring the maintenance of adequate control over its enriched uranium. The officials also reported that, while they had not made a complete survey, which would have included an audit of the records and AEC verification of the inventory, the scope of the review had been sufficient to permit a determination as to whether NUMEC's procedures as recently approved by AEC were being followed. AEC records do not indicate whether NUMEC was advised of the results of this review.

In October and November 1966, ORO, assisted by AEC Headquarters personnel, made a survey at NUMEC. A survey report was transmitted to NUMEC on January 24, 1967, which stated that, in the opinion of the survey team, there had been improvements in the area of nuclear material control since the survey was made in November 1965, as evidenced by the fact that 12 of 13 recommendations made in that report had either been accomplished or were being accomplished. The report also stated that, on the basis of the survey and discussion with NUMEC's management, the survey team was of the opinion that the accountability control system that had been established by NUMEC, on the basis of the company's approved procedures manual, was capable of providing adequate internal control of special nuclear material for safeguard purposes if it was followed in all aspects.

On the basis of its survey, however, AEC was unwilling to accept NUMEC's inventory. In this connection the report stated that:

"Despite the actions taken, the survey team is of the opinion that the SN material inventory report presented by NUMEC as of September 30, 1966, does not fairly present their actual holdings as of that date because:

"a. NUMEC has not maintained complete records of known process losses of SN material and, therefore, the quantities of material reported as losses during the period November 1, 1965 through September 30, 1966, are understated. ***.

"b. Label data used to derive the NUMEC inventory was not sufficiently accurate as to quantity of uranium to provide an accurate inventory. ***.

"c. The NUMEC inventory report did not include material contained in approximately 590 items (filters and combustibles) stored in the blue building. ***."

Regarding the first point, AEC noted in its report that accountable effluent losses through stacks and liquid discharges were not being reported as known losses; therefore, it was not possible to obtain a reliable estimate of known losses for the survey period. NUMEC advised AEC that such losses had not been reflected in its reports because of uncertainty with respect to the means of apportioning these losses to specific contracts. AEC noted that NUMEC agreed to report such losses on a proration basis in the future.

With respect to the unrecorded material in the blue building, AEC noted that:

"*** NUMEC management stated that they understood that the AEC planned to measure all filters and combustibles by gamma scan methods and, therefore, they had not performed measurements. Since it never was the intent of the survey team to other than spot check by gamma scan a misunderstanding of what would be done exists."

One of the eight recommendations made to NUMEC stated that an inventory should be made at the earliest practicable time that "*** will reflect truly the actual physical holdings of SN material and that the book inventory be corrected to the physical inventory."

In transmitting the report to NUMEC by letter dated January 24, 1967, AEC's Assistant General Manager for Administration stated:

> "It is recognized that improvements have been made by NUMEC in the area of nuclear materials controls particularly in the establishment of satisfactory procedures. Deficiencies still exist in following the procedures and in the taking of a good physical inventory followed by the adjustment of the records to the physical inventory data. As you know, the NUMEC management and control program for special nuclear material has been of considerable concern to us over an extended period of time. We therefore expect that you will take prompt action to correct the deficiencies noted. In the absence of such corrective action, we will feel constrained to consider actively the measures which may be appropriate either in the administration of the Commission's prime contracts or subcontracts with NUMEC or in the exercise of its regulatory powers."

NUMEC responded to AEC by letter dated January 25, 1967, and expressed regret that AEC was unable to accept NUMEC's inventory as of September 30, 1966. NUMEC stated its disagreement with AEC's opinion on this matter, stating further that:

> "*** the acceptance criteria and the related statistical treatment of the test results were not those which had been used in evaluating past inventories at NUMEC, and, moreover, that the criteria utilized in the October inventory are basically experimental and 'have not been officially adopted'. It is unfortunate that the new criteria utilized in verifying the October inventory were not communicated to the Company prior to the initiation of the inventory. Such information would have

assisted materially in our preparation for the inventory, particularly in the categorization of the materials to be inventoried, and would thereby have assisted in avoiding utilization of too loose or too tight acceptance criteria, as noted in [AEC's] report."

NUMEC stated that it was proposing March 31, for a physical inventory and advised AEC of the actions that had been and were being taken to comply with the recommendations.

By letter dated February 10, 1967, ORO advised NUMEC that it would observe the taking of the March 31, 1967, physical inventory and submitted for NUMEC's consideration a survey plan summary which had been developed by ORO as a means of arriving at a mutual understanding of the survey plans. ORO advised NUMEC that:

"*** you should make every effort prior to the inventory, to reprocess as much scrap to a measurable state as possible, and to consolidate items to reduce the inventory to a more desirable inventory position."

Subsequent to the February 10, 1967, letter, AEC and NUMEC agreed to delay the survey until April 30, 1967, because it was expected that by that time the uranium inventory would have been reduced because of completion in April of a job involving a large quantity of highly enriched uranium. It was expected that, with this reduction in inventory and the clean up of a substantial portion of the plant, a more accurate physical inventory could be taken.

We were subsequently advised by AEC that its planned March 31, 1967, inventory verification had been postponed because of the condition of NUMEC's uranium inventory. NUMEC had advised AEC that approximately half of its uranium inventory was in scrap residues.

NUMEC proceeded with its physical inventory on April 30, 1967, and so advised AEC during a meeting on May 4, 1967. We were informed that it had been agreed during the meeting that NUMEC provide AEC with (1) a detailed description of the steps it used to take the inventory, (2) all sampling, analytical, and other measurement data obtained from the physical inventory and NUMEC's interpretation of such data, and (3) NUMEC's statement of its April 30, 1967, inventory. We were further informed that an AEC survey team had arrived at NUMEC on May 10, 1967, to review the current situation.

SPECIAL NUCLEAR MATERIAL LOSSES
AT NUMEC'S APOLLO FACILITY

In November 1965, AEC made a detailed survey to determine the total cumulative U-235 loss at NUMEC since start-up in 1957 and to attempt to find explanations for the "unexpectedly high U-235 loss" on the WANL contract.

On the basis of AEC's survey findings, the report stated that the total cumulative loss, including known losses, discards, and MUF, at NUMEC during the period from plant start-up in 1957 until October 31, 1965, had been established as 178 kilograms U-235. The report stated that, during this period, NUMEC had recognized and reported cumulative losses of 149 kilograms U-235, or 29 kilograms U-235 less than the amount established by the AEC survey. The report also stated that, because of a large number of heterogeneous uranium-bearing residues on inventory which could not be sampled, some upward or downward revisions of the established loss might be necessary.

The survey team estimated that, of the total of 178 kilograms U-235 lost to October 31, 1965, 84.2 resulted from known loss mechanisms, and the remaining amount of 93.8 kilograms U-235 was categorized as MUF. MUF is defined as the difference between the physical inventory and the book inventory after the latter has been adjusted for losses resulting from known loss mechanisms, such as accidental losses, normal operational losses (discharges into 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 in the records. As stated by the team, the amount as developed was based on estimates; however, the loss mechanisms identified appeared appropriate and the largest part of the known losses was traceable

to records or could be developed by analyzing existing data and applying judgments thereto.

On an overall basis, AEC calculated that the estimated loss of 178 kilograms U-235 amounted to about 1.2 percent of total plant receipts since start-up. The report stated that:

> "This cumulative loss, while larger (both on an absolute and relative basis) than those reported by other commercial facilities conducting more or less comparable operations, does not appear to be so much larger as to be unexpected, ***."

During the period of our review, we found that additional losses had been disclosed and NUMEC's records showed that cumulative losses of U-235 through December 31, 1966, totaled about 260 kilograms, or about 1.2 percent of total receipts. These losses, which were reported to AEC through periodic status reports by NUMEC to ORO, included known and identifiable process losses and MUF which was disclosed by physical inventories or by material settlements at the completion of jobs. NUMEC advised us that the increase in losses since the October 1965 inventory was almost entirely attributable to losses incurred in processing large quantities of material during the intervening period.

The AEC report on the November 1965 survey presented the view that, while it could not be stated with certainty that diversion did not take place, the survey team found no evidence to support the possibility of diversion. The report added that the survey team and others observed a number of NUMEC's practices that reduced the possibility of diversion.

With respect to AEC's observation regarding overall losses at NUMEC, we were advised that AEC's view as to the reasonableness of the losses was based on its experience in the nuclear materials

management field. AEC has not established standards on which to base an evaluation of a contractor's loss performance. In regard to MUF, we are unable to state an opinion on its disposition. Because of the condition of NUMEC's records, a determination could not be made as to the approximate period of time or the process area in which the MUF occurred. We found no evidence of diversion. After considering all available information, including NUMEC's explanation of the losses related to the WANL contract (a copy of which is attached as appendix II), we have no reason to question AEC's conclusion regarding the matter of diversion.

Comments on the WANL contract

In September 1962, WANL entered into a fixed-price contract with NUMEC to furnish a product to WANL to be used in the manufacture of nuclear fuel elements. Under the terms of the contract, NUMEC had full financial responsibility for all special nuclear material furnished to it for the production of the product. Any excess enriched uranium and all scrap generated by NUMEC in fabricating the product was to be processed, as part of the contract price, to an acceptable chemical form meeting established AEC specifications and returned to AEC or paid for within 180 days after the final delivery of product to WANL.

Under the terms of the contract, for the first 90 days after final delivery of the fabricated product to WANL, no inventory use charge was to be imposed on NUMEC for the enriched uranium still in its possession; thereafter, however, a use charge of 4-3/4 percent per annum of the value of the material still in the possession of NUMEC was to be assessed. The contract also provided for the right of repossession by AEC of the enriched uranium at the expiration of the 180 days.

During the course of the contract, NUMEC was furnished with about 1,013 kilograms U-235 of which about 713 kilograms U-235 was delivered as acceptable product to WANL; thus, NUMEC was required to return to AEC about 300 kilograms U-235. On August 12, 1964, NUMEC made its final shipment of the fabricated product to WANL. By agreement with WANL, NUMEC continued experimental efforts to upgrade the product to meet new specification requirements. According to WANL, the actual contract completion date was October 30, 1964, because, on that date, WANL made its determination that the experimental material fabricated by NUMEC after August 12, 1964, would not meet the new WANL requirements.

On the basis of this completion date, assessment of inventory use charges was to commence on January 29, 1965, and the final settlement date was established at April 28, 1965. According to AEC records, NUMEC informed Government and WANL personnel that NUMEC would not be able to settle the contract on the specified date. Further, according to AEC records, NUMEC suggested that accountability for the remaining WANL material charged to NUMEC be transferred to NUMEC's supply agreement, previously entered into with ORO. By doing so, the final settlement date for material losses could be postponed until NUMEC could process the scrap remaining under the WANL contract. In the interim, NUMEC would continue paying the inventory use charge.

The proposal was agreed to by AEC providing that (1) the quantity of material to be transferred be established on the basis of a physical inventory and (2) prior to the transfer, NUMEC pay for any losses incurred under the WANL contract.

According to AEC's records, two 1-month extensions of the closeout date were made in order to take the physical inventory.

As of April 30, 1965, the date of the inventory taking, NUMEC had declared losses under the WANL contract of about 33 kilograms U-235; AEC's physical inventory disclosed an apparent loss of about 53 kilograms U-235, indicating a liability on NUMEC's part of about $735,000.

NUMEC refused to accept AEC's loss computation on the basis that AEC's calculations did not give proper effect to all recoverable sources of uranium. Consequently, the transfer of the accountability for the remaining WANL material to the supply agreement was not consummated. AEC estimated that, under the assumption that NUMEC was correct in its calculations, NUMEC's financial responsibility would amount to about $650,000. Negotiations were thereafter conducted with NUMEC to reach a settlement on the WANL contract. Our comments on the material losses ascribed to the WANL contract and to the financial settlement follow.

Comments on special nuclear material loss ascribed to the WANL contract

The AEC survey in November 1965 ascribed a loss of about 61 kilograms U-235, or about one third of NUMEC's cumulative estimated losses of 178 kilograms at that time, to the WANL contract. At that time, AEC reported that NUMEC had recognized and reported losses of 38 kilograms U-235 as being chargeable to the WANL contract; this was about 23 kilograms U-235 less than AEC's calculations. Notwithstanding extensive reviews of NUMEC's operations, neither AEC nor NUMEC have been able to identify with a high degree of certainty the specific causes of WANL material loss.

On November 28, 1966, settlement of the WANL contract was made. An analysis of material transfers under the WANL contract as of that date is presented in the following schedule:

Schedule of Special Nuclear Material
Received from, Returned to, and not Returned to AEC
by NUMEC under the Contract

	Uranium (grams)	Enrichment (percent)	U-235 (grams)
Receipts:			
Total material received by NUMEC for WANL job	1,086,946	93.15	1,012,505
Shipments:			
Finished product shipped to WANL	765,089	93.13	712,515
Balance to be returned	321,857		299,990
Scrap recovered and returned:			
As of December 22, 1965	231,041	89.55[a]	206,894
December 22, 1965, to November 23, 1966	159,591	16.40[a]	26,048
Total scrap returned	390,632		232,942
Balance not returned:			
Loss (gain)	(68,775)		67,048[b]

[a]Average enrichment of the 22 lots returned as of December 22, 1965, and additional 15 lots returned as of November 23, 1966.

[b]A cash settlement of about $929,000 was made by NUMEC for this material.

As shown in the schedule, NUMEC returned a greater quantity of total uranium than it was furnished but the U-235 content returned was about 67 kilograms less than that received. On the basis of NUMEC's explanation of the WANL loss contained in appendix II and the foregoing analysis of material transfers under the WANL contract, it is apparent that non-WANL material has been returned for credit under the WANL contract and/or that WANL material was mingled with other material, with the result that most of the non-product WANL material returned to AEC was significantly degraded.

This significance is shown by the fact that, for the quantity of scrap recovered and returned as of December 22, 1965, the difference between 231 kilograms of 93.15 percent enriched uranium and 231 kilograms of 89.55 percent enriched uranium, represents over 8 kilograms of U-235, or, on the basis on AEC's published schedule of enrichment charges, an economic loss of about $105,000.

During our review at NUMEC, we attempted to trace the internal movements of the WANL material by material balance areas (MBAs). MBAs are described in the AEC manual as control units into which a facility may be subdivided to provide closer control of material flows, to localize losses, and to provide means of simplifying the taking of physical inventories. MBAs may be established around individual processes, separate steps of a process, separate geographical areas, or organizational subdivisions. The NUMEC facility is subdivided into MBAs, and, under the company's procedures, internal transfer documents are to be used to support the movements of the material between MBAs. The internal transfer documents are to be used also for posting to the internal control ledger which summarizes the material balances in each MBA.

We were unable to trace the WANL material movements because the records were incomplete. According to NUMEC officials, internal transfer documents were not always posted to the internal transfer ledger; thus the resulting effect was that the ledger did not accurately show the balances of material at the MBAs. During the period of the WANL contract, NUMEC did not ascertain losses associated with the WANL contract by MBAs. We were advised that, during the period of the WANL contract, physical inventories were taken on a plant-wide basis rather than by MBAs; therefore, the results of the inventories were not recorded in the internal control ledger that indicated material balances by MBAs.

As a result, this ledger could not be reconciled with the general ledger. From our examination of NUMEC's records, we noted that losses reported through April 1965 were generally not identified as resulting from known loss mechanisms. In relation to this, NUMEC's records made available to us showed that burials of scrap residues were made during the period of the WANL contract; these records, however, did not show the quantities of uranium actually buried although records showed that NUMEC subsequently recovered about 7.4 kilograms of U-235 from the burial pits. Also, NUMEC advised us that part of this problem was a result of its uncertainty with respect to the best means of prorating losses due to effluent discharge mechanisms and, as stated previously, that matter has now been resolved.

A NUMEC official advised us that the internal transfer documents were prepared when material was transferred and were used as receipts for the MBA transferring the material. The official stated that the foremen accumulated the documents but eventually they might be lost or discarded and thus not all documents would be posted to the internal transfer ledger.

AEC apparently encountered similar problems in its analysis of NUMEC's records. The AEC Headquarters report on its November 1965 survey stated that the findings of previous surveys were confirmed in that the records which purport to control internal movements of material were incomplete and inadequate; therefore, it was impossible to identify with a high degree of accuracy the true physical losses attributable to any given contract. AEC noted that the plant-wide material records were based largely on book values of inventory and generally were adjusted for losses only at the time of closing a contract. AEC's report also contained the following comment:

> "In an attempt to establish yields and loss mechanisms directly applicable to this purchase order [WANL contract] the survey team requested NUMEC production control and process engineering data on this and other contracts. The data available was of little or no value in this regard. Process lots or batches could not be correlated to points in time nor could a sequence of processing events be established. All efforts in this direction were negated when it was learned that many of the requested records had been inadvertently destroyed by supervisory personnel during a 'clean up' campaign at the time of an employee strike, January 1 to February 25, 1964."

Comments on financial settlement of special nuclear material loss under the WANL contract

Under the terms of the contract, use charges were imposed beginning January 29, 1965, on material not returned by NUMEC to AEC. Final settlement was to have been made April 28, 1965, which was 180 days after contract completion as determined by WANL. Two 1-month extensions of the closeout date were made in order to take the physical inventory and WANL was instructed to take no further action toward settling the contract until receiving further direction.

Such direction was provided to WANL on November 17, 1965, and, effective November 23, 1965, WANL and NUMEC entered into a supplemental agreement under which NUMEC agreed to pay to WANL or AEC, by no later than November 23, 1966, the amount of $1,134,849.34, representing the value of the special nuclear material still chargeable to NUMEC's account. In terms of material quantities, the amount represented the value of about 94 kilograms U-235. Further, under the agreement, NUMEC agreed to pay interest at 6 percent per annum on any amounts unpaid subsequent to December 23, 1965. Since January 28, 1965, NUMEC had been paying a use charge as provided in the contract at the annual rate of 4-3/4 percent on the value of material not returned.

In accordance with the agreement of November 23, 1966, NUMEC, in liquidating its liability, returned material having a value of about $301,000 and made payments totaling about $834,000, which included about $74,000 retained by WANL from contract payments. Also, prior to the assessment of interest, NUMEC had paid use charges totaling about $68,900 and subsequently had paid interest totaling about $25,800. In terms of material quantities, NUMEC's

ultimate shortage on the WANL contract amounted to about 67 kilograms U-235 and the settlement necessitated a cash outlay on NUMEC's part of about $928,700.

We believe that the financial arrangement for settlement of the material losses on the WANL contract provided reasonable protection of the Government's financial interest in the special nuclear materials. A question could be raised as to whether interest rather than use charges should have been assessed from the date that the contract was originally scheduled to terminate, April 28, 1965, until the date that supplemental agreement was effective, November 23, 1965. Had interest been assessed, the maximum additional income that AEC could have realized would have amounted to about $9,400.

Another point relates to a financial benefit that may have accrued to NUMEC. In explaining how the material losses occurred on the WANL contract, NUMEC has stated that WANL material, as a result of NUMEC's scrap recovery operation, had been mixed unknowingly with other material and was returned under other contracts. If it is assumed that this assertion is valid, NUMEC, in effect, realized a deferral of liability for payment of losses under those contracts where WANL material may have been returned. The financial benefit that may have accrued to NUMEC as a consequence of such action does not appear to be susceptible to measurement because of the nature of NUMEC's records.

SUMMARY EVALUATION AND CONCLUSION

Under the Atomic Energy Act of 1954, as amended, AEC is authorized to prescribe such regulations or orders as it may deem necessary to guard against loss of special nuclear material. A basic fundamental to any arrangement for control over special nuclear materials in the hands of industrial firms is the principle of periodic accounting for such materials. To fully implement this principle, a materials control system must be devised requiring the use of records and reports showing the quantity of material that should be on hand and the taking of periodic physical inventories to show how much material is, in fact, on hand. Another aspect of this system is the development of records in such a manner as to permit the timely detection and localization of losses.

As shown by our review, neither AEC nor NUMEC could identify the specific causes for MUF of about 93 kilograms U-235 as of October 31, 1965, a substantial portion of which loss was ascribed to the WANL contract. With respect to the WANL contract, the alternative possibilities that present themselves are that the losses occurred in a number of contracts over a period of years without being detected and the WANL contract became a repository for such losses or that the losses occurred within the WANL contract itself. The condition of NUMEC's records do not permit us to make a conclusive determination as to the time or the manner in which the losses occurred. AEC reviews and other data suggest that the losses occurred over a period of years.

Underlying this inability to detect on a timely basis and determine the reasons for such a significant loss of special nuclear materials are both ultimate and proximate causes. The ultimate or underlying cause, in our opinion, was the system of control that

evolved as a result of AEC's decision in 1955 to rely, in making available special nuclear materials to licensees, on the concept of intrinsic value and severe criminal penalties to adequately protect the Government's interest. The proximate causes are that there was an absence of definite criteria to direct or guide NUMEC in the formulation of an acceptable materials control system and a lack of an effective approach to obtain improvements in the NUMEC system.

AEC surveys over the years have repeatedly identified the need for improvements to NUMEC's materials control system, and, at various intervals, have resulted in concern as to the adequacy of NUMEC's controls over special nuclear materials. For the most part, AEC has attempted to obtain improvements in NUMEC's system through encouragement and suggestions, rather than by more aggressive efforts to ensure the existence of an accurate and reliable materials control system. For example, considering the concern evidenced, we feel that it would have been appropriate to institute a resident inspection system at NUMEC to provide AEC assurance that an accountability system was being developed and maintained, which would afford effective control over the material.

Although AEC records indicate that NUMEC has generally responded to suggestions made as a result of the surveys, it appears that NUMEC did not exert the sustained effort necessary to effect and maintain the accountability system improvements necessary for the localization and timely detection of losses. As late as the November 1965 survey, AEC stated that its audit of NUMEC records confirmed the findings of prior surveys that the records which purport to control internal movement of material were incomplete and

inadequate. Consequently, it appears that relatively significant progress in the development of a sound accountability system has occurred only in the recent past.

A significant factor which we believe may have worked against AEC's ability to achieve the development of an effective materials control system at a much earlier date was that AEC did not define, except in broad terms, for the benefit of NUMEC, criteria or requirements which AEC considered necessary in the formulation of an adequate materials control system. As a result, AEC was conducting reviews and making suggestions or recommendations for improvements on the basis of criteria which was not necessarily apparent to NUMEC.

Another factor which may have hindered the development of an effective system was AEC's apparent inconsistency in its dealings with NUMEC. Generally, AEC reports, as a result of detailed surveys, would identify the need for improvements; these needs, in our opinion, indicated serious weaknesses in NUMEC's system. Later, after brief visits to NUMEC, AEC would compliment NUMEC on the progress being made. Succeeding detailed surveys would thereafter recite problems similar to those disclosed in prior surveys. As an illustration, in October 1960, AEC's first survey report notified NUMEC of the need to establish controls to localize losses; its most recent report, issued to NUMEC in January 1967, had recommended improvements in this area.

Also, it appears to have been incumbent on NUMEC to ensure the effective implementation of system improvements since, on the basis of the record, it should have been evident to NUMEC that its system was not providing a current and accurate accountability for the special nuclear materials for which it was responsible. In our

opinion, had AEC and NUMEC effectively followed through toward the maintenance of a system which would localize and detect losses in a timely manner, it is conceivable that the specific causes of the experienced losses could have been identified.

In May 1966, after reviewing its policy which was based on the intrinsic value concept, AEC concluded that a change should be made in the direction of placing more reliance on positive requirements, with respect to domestic safeguards for licensees. There was, among the actions taken to strengthen the program since that time, approval by AEC on January 25, 1967, of amendments to 10 CFR 70 which will require licensees holding more than specified minimum quantities of nuclear material to:

1. Establish and maintain written procedures for the control and accounting for special nuclear material in their possession.

2. Submit full descriptions to AEC of the procedures for control and accounting for special nuclear material and identify to AEC the fundamental controls considered necessary for adequate safeguarding of the material.

3. Perform inventories not less often than annually.

In addition, provision has been made for expansion of the scope of surveys of special nuclear materials, held under lease and under fixed-price contracts and subcontracts, to include a determination of the quantities of and the probable causes of process losses, accidental losses, wastes, write-offs, and MUF, and an evaluation of the significance of these quantities.

We believe that AEC's revision of its 1955 decision toward controls over special nuclear materials in the hands of licensees is appropriate. The need for this revision became more imperative

with the advent of private ownership of special nuclear materials. This step in the development of the atomic industry will entail a lessening of the traditional contractual controls under which material has been furnished by AEC. Also, the need for more effective safeguards control is indicated in consideration of the anticipated growth of nuclear power, which will require greater participation by private industry in such areas as fuel fabrication and chemical separation and the handling of larger amounts of highly enriched uranium and plutonium.

With respect to the current situation at NUMEC, our review showed that, in the past year, NUMEC has made relatively significant improvements to its materials control system. For example, our review of selected transactions after January 1966 showed that, through a subsidiary ledger, NUMEC was maintaining control over material by individual job and by material balance area and that the subsidiary ledger was being reconciled with the general ledger. In addition, NUMEC's records of recent burials were more complete and meaningful. Also, we noted that AEC's report on its most recent survey showed that 12 of the 13 recommendations for improvements in the accountability system, made as the result of the prior survey, had been accomplished or were in the process of being accomplished by NUMEC.

We noted that improvements are still necessary in the area of localization and timely detection of losses. Also, on the basis of its most recent survey, AEC, while recognizing that improvements have been made by NUMEC in the area of nuclear materials control, has yet to be satisfied as to the adequacy of the implementation of NUMEC's system. By letter dated January 25, 1967, NUMEC advised AEC of the actions that had been and were being taken to comply

with recommendations in AEC's most recent survey report and proposed March 31, 1967, as a date for a physical inventory of special nuclear material at NUMEC.

By letter dated February 10, 1967, ORO advised NUMEC that it would observe the taking of the March 31, 1967, physical inventory and would conduct a survey and submitted for NUMEC's consideration a survey plan summary which had been developed by ORO as a means of arriving at a mutual understanding of the survey plans. We were subsequently advised that, by mutual agreement between AEC and NUMEC, the survey was delayed until April 30, 1967, because it was expected that by that time the uranium inventory would have been reduced, and a more accurate physical inventory could be taken.

After considering the history of this case, we expressed the view to NUMEC and AEC that this survey should be utilized as a basis for developing a mutual understanding and agreement on AEC requirements and for establishing jointly a fully acceptable materials control system on a timely basis.

We were subsequently advised by AEC that its planned April 30, 1967, inventory verification had been postponed because of the condition of NUMEC's uranium inventory. NUMEC had advised AEC that approximately half of its uranium inventory was in scrap residues.

NUMEC proceeded with its physical inventory on April 30, 1967, and so advised AEC during a meeting on May 4, 1967. We were informed that it was agreed during the meeting that NUMEC would provide AEC with (1) a detailed description of the steps it had used to take the inventory, (2) all sampling, analytical, and other measurement data obtained from the physical inventory and NUMEC's interpretation of such data, and (3) NUMEC's statement of its April 30, 1967, inventory. We were further informed that an AEC survey team arrived at NUMEC on May 10, 1967, to review the current situation.

APPENDIXES

Congress of the United States

JOINT COMMITTEE ON ATOMIC ENERGY

September 7, 1966

Honorable Elmer B. Staats
Comptroller General of the United States
General Accounting Office
Washington, D. C.

Dear Mr. Staats:

This will confirm the discussion on August 29, 1966 between the JCAE and GAO staff in which AEC representatives participated.

With the implementation of the private ownership legislation, the Joint Committee has been concerned as to the adequacy of AEC's regulations and contractual arrangements relating to the accountability and safeguarding of special nuclear material. The Committee is particularly interested in ascertaining what changes, if any, may be necessary in existing regulations, contracts and procedures, particularly with regard to AEC licensees.

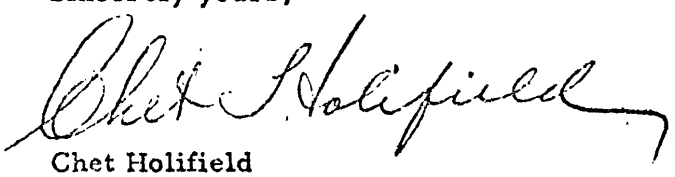
In this connection I would appreciate it if the GAO will review the past procedures employed by Nuclear Materials and Equipment Corporation (NUMEC) for the safeguarding and accountability of AEC-owned special nuclear material. The GAO is requested to review the written reports of AEC's investigation of the recently reported loss of substantial amounts of special nuclear material at NUMEC and to examine into the determination of loss charges and associated AEC use charges. Particular attention is requested to be given to appraising the internal controls and accountability of special nuclear material, including review of the company's financial and inventory control records. Thereafter, it is requested that the GAO make a comparative review of two or three other companies doing comparable work under similar AEC regulations and contractual arrangements in an effort to ascertain to what extent the situation at NUMEC may be unique or if it is characteristic of the industry.

Honorable Elmer B. Staats

I would appreciate it if a written report of your findings and conclusions will be submitted to the Joint Committee at your earliest convenience.

Thank you for your past and present cooperation.

Sincerely yours,



Chet Holifield
Chairman

NUMEC

Nuclear Materials and Equipment Corporation Apollo, Pennsylvania 15613 Telephone GRover 2-8411 Cable NUMEC

December 29, 1965

Mr. Douglas George
Director, Division of Nuclear Materials Management
United States Atomic Energy Commission
Washington, D. C. 20545

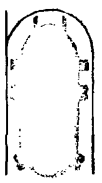
Dear Mr. George:

In the course of the past two months, representatives of The Division of Nuclear Materials Management have conducted an extensive physical inventory at NUMEC and have examined the Company's records in an effort to determine the disposition of approximately 55 kilograms of uranium-235, presently unaccounted for under Westinghouse Astronuclear Purchase Order No. 59-NP-12674. Although the precise dimensions of the materials loss have not as yet been established, we fully appreciate the overriding importance of investigating and resolving any question of safeguards connected therewith at the earliest possible date.

Necessarily, in any task as complex as the Commission's current investigation, your staff will have derived a vast amount of information from the records of the Company and through conversations with NUMEC personnel. Because much of this data has been derived from old and, in some instances, incomplete records or from the recollections of individuals of the events of several years ago, the information you have received may be somewhat fragmentary. Accordingly, I believe it would be helpful if we were to set forth, as completely as possible, our best analysis of the disposition of the material presently unaccounted for under Purchase Order 59-NP-12674 (NUMEC Contract 1231).

Unusual Nature of The 1231 Contract

In order to place this matter in perspective, it is important to understand the nature of the product and the process required under the 1231 Contract. The manufacture of pyrolytic graphite coated uranium dicarbide fuel particles on a production scale had never been done before. In general, the process involved the following steps: (1) conversion of UF_6 to UO_2; (2) blending of UO_2 with graphite and a binder material; (3) pressing of the



blended material into sinter stock; (4) sintering of the pressed material; (5) crushing of the sintered stock to form melt stock; (6) melting of the material by direct arc to form carbide ingots; (7) crushing, grinding and sizing of the ingots to form fine on-size particles; (8) spheroidizing of the particles in a plasma torch; (9) carbon coating of the spherical particles in an induction heated fluid bed reactor in an atmosphere of methane and an inert carrier gas.

Although the foregoing is only a brief description of the process, it may serve to illustrate the complexity of the manufacturing operation which may be characterized fairly as an extremely dirty and dusty process. As described below, more fully, NUMEC's product yield in this process was quite low, necessitating an extensive recycling of material in order to deliver sufficient product to the customer. Extensive recycling of material, as you know, inevitably involves a repetition of losses.

As noted earlier, the manufacture of this material was, for NUMEC, a "first of a kind contract"; it has never been performed again by the Company. Consequently, our direct experience factors are limited in terms of comparing the losses on this job with other contracts. Nevertheless, we believe it is not inconceivable that high losses* -- perhaps up to 30 kilograms of material (or 3%) -- may have been experienced in this unique and complex operation. For instance, on jobs involving the same number of unit operations, but on material inherently less dusty in nature, we have experienced losses of the same magnitude.

Even assuming, however, that such losses were experienced, this will not fully explain the disposition of the total amount of U-235 presently unaccounted for, approximately 6 percent of the total U-235 received by NUMEC for processing under the contract. Such an explanation must be derived from an examination of NUMEC's scrap recovery operations.

Scrap Generated Under 1231 Contract

The basic reference point in an inquiry into the disposition of 1231 material must be the amount of scrap generated under the contract.

*As used in this context, losses are defined as both the accounted for and the unaccounted for losses, i.e., all material not shipped to the customer as product or returned to the Commission as recovered from scrap.

The records of NUMEC's CP-2 facility, in which the initial conversion of UF_6 to UO_2 was performed, show that 1240 kilograms of material entered the facility for conversion under the 1231 contract. It should be noted, however, that only 1087 kilograms of UF_6 containing 93+ percent U-235 were furnished by the customer for conversion under the contract. The difference (153 kilograms) represents the quantity of recycled material required to make the final product accepted by the customer. It is, therefore, apparent that 153 kilograms of recycle material were, at some point, reprocessed in NUMEC's facilities. Illustrative of the process by which such recycle material is generated is the initial conversion (UF_6 to UO_2) in the CP-2 facility. NUMEC's records show that this conversion was performed in [redacted] discrete batches of approximately 163, 272, 252, 150 and 350 kilograms each, spaced three months apart between October 1962 and October, 1963. One would expect to leave behind, in the first pass through the facility, approximately ten kilograms of material from each batch. This non-yield uranium settles in clean-up materials and in the form of other wastes which are subsequently recovered and recycled. Thus, in the initial step of the process, at least 50 of the 153 kilograms of scrap described above, were generated.

It is also clear, in view of the fact that 1087 kilograms were processed to produce 763 kilograms of end product [redacted] that NUMEC had as inventory, after final product shipments, some 324 kilograms of material (process losses aside) which it was required to reprocess.

Finally, it should be noted that 65 kilograms of uranium, in the form of UO_2 prepared by NUMEC from the aforementioned scrap, were rejected by the customer. This material, too, required reprocessing.

In summary, a total of 542 kilograms (153 + 324 + 65) of scrap uranium, generated under the 1231 contract, were at various times injected into NUMEC's scrap recovery stream. It is in the reprocessing of this 542 kilograms of material that there exists the greatest possibility of mixing and consequent allocation of special nuclear material to other contracts.

The Nature of NUMEC's Scrap Recovery Operations

The possibility for the allocation of materials generated in the recovery of scrap to contracts other than 1231 is quite great in view of the manner in which NUMEC's scrap recovery operation was conducted.

A scrap recovery facility, in a company handling a large number of special nuclear materials contracts each year, cannot be reserved for an extended period of time to recover all of the scrap that may be generated

under a contract which may require a year or more to complete and which, from time to time, may generate quantities of scrap material. Of necessity, the scrap from a long-term contract must be scheduled for recovery intermittently with scrap material from other contracts. Such was the case with respect to the 1231 scrap material.

A major clean-up between jobs would be required in order to insure against the downgrading of material in an intermittent operation of this type. Such a clean-up itself, however, will generate additional losses since material is bound to be lost in the huge amounts of solution required to adequately clean the complex equipment in the plant.

Moreover, since the scrap recovery operation involves a solvent extraction process, one must reach near saturation equilibrium in the plant before extracted material is chemically clean. Thus, the first material removed from the process must always be recycled to achieve clean material. Correspondingly, the material last removed from the process is, as a general matter, never pure enough to be used in end product and, therefore, again becomes scrap.

The foregoing suggests the economic infeasibility, if not the practical impossibility of totally segregating each job in a plant with a view toward "finishing" each job before moving to the next. To offset these consequences, it was NUMEC's practice to segregate material by contract only through the point of dissolution, at which point the accountability under a given contract was established. Thereafter, our scrap recovery equipment was operated on a "heel to toe" basis without segregation of material between jobs. Thus, if scrap from ten jobs, for example, was processed in one recovery campaign, certain assumptions had to be made in assigning the recovered material between the originating contracts. This assignment was made on a basis proportionate to each contract's feed contribution. Losses were calculated in the manner described below. We believe that this method of scrap recovery operation is generally consistent with industry practice.

Disposition of 1231 Material (1962-63)

With this information as background, it becomes pertinent to examine the scrap recovery contracts most likely processed at NUMEC during the same time the 1231 contract was active. Table I, attached, lists these contracts. We believe these jobs were run on a "heel to toe" basis in conjunction with the recycle and/or scrap material from Contract 1231. Excluded, however, are those contracts involving the processing of uranium of less than 5% enrichment. Since NUMEC maintained a separate reprocessing facility for material less than 5% enriched, it is unlikely that such material would have been run on a "heel to toe" basis with highly enriched material.

The total quantity of uranium represented by the contracts in Table I is approximately 470 kilograms of U-235. These jobs were closed out with an average overall U-235 loss of approximately 1.5 per cent, or 7 kilograms. The average 1.5 per cent loss figure was selected on the basis of our best estimate, at the time, of the losses experienced in our recovery operation. A definite figure could not be established since, in the "heel to toe" process, described above, there was no complete clean-up between reprocessing campaigns. It is important to note, at this point, that due to the complexity and quantity of the scrap on hand during 1962-1963, there was a large uncertainty with respect to total plant accountability during this period. As a result there was no clear evidence, at the time, to indicate that the 1.5 per cent figure was inaccurate.

It was only within the last year, during which NUMEC performed two large scrap contracts of 108 kilograms [AT(40-1)3302] and 137 kilograms [AT(40-1)3376] that it became evident that the losses were greater than those initially anticipated. In both cases, a closed accountability was maintained; that is, there was no "cross-over" between jobs. In the first case, losses were 4.1 per cent; in the second, 3.0 per cent. (The second contract is approximate because final accountability has not been established.) In both cases the scrap involved was similar in nature to that processed during 1962-1963 and, accordingly, utilized nearly the same process chemistry and equipment. On the basis of our current experience, it would appear that a loss factor of 3.5 per cent may have been more appropriate than one per cent. On this basis, the losses experienced under the scrap recovery contracts itemized in Table I could have been 16.5 kilograms instead of the 7 kilograms declared. This would suggest that approximately 9 kilograms of 1231 contract U-235 could have been inadvertently mixed and returned with material under these scrap recovery contracts.

To further substantiate the possibility of mixing of material from the 1231 contract, we refer you to a letter of July 8, 1963, from A. H. Kasberg, NUMEC, to T. C. Johnson, Westinghouse Astronuclear, a copy of which is attached. This letter indicates that 30 kilograms of out-of-specification UO_2 (26.3 kgs of U) was scheduled for scrap return to Oak Ridge. The only supporting evidence to show that this material was returned is an entry on NME-CCC-95, a copy of which is attached, indicating that only 21.4 kilograms of uranium, slightly downgraded, was returned. This suggests the possibility that 4.6 kilograms of 1231 contract material may have in the course of scrap recovery, been returned under other contracts.

A further example is illustrated in the attached memo of October 5, 1963, from C. Beltram, NUMEC, to F. Forscher, NUMEC, describing a degradation incident involving 2.7 kilograms of 1231 contract material. We find no evidence that this material was returned as 1231 material. It can be reasonably inferred that this material may have been recovered along with other scrap material and subsequently returned, although possibly misidentified.

These are but examples of specific instances in which 1231 contract material might have been mixed with other scrap. The fact of overriding importance, however, is that because of the nature of NUMEC's scrap recovery operations, it is highly probable that scrap from the 1231 contract may have been returned under other purchase orders.

Disposition of 1231 Material as a Function of Overall Company Operations (1960-1963)

The foregoing analysis covers only the period during which 1231 contract material was being processed at NUMEC. It is important to note, however, that the same type of scrap recovery operation was conducted at NUMEC prior to the arrival of the 1231 material creating the same possibility of unavoidable mixing of material. In the period, prior to and during which, 1231 material was being processed at NUMEC, a large number of scrap recovery contracts involving 1020 kilograms U-235 in scrap were processed and closed including contracts shown in Table I, plus additional contracts shown in Table II. Using an estimated average 1.5 per cent loss figure, NUMEC declared losses of approximately 15 kilograms U-235 on these contracts. Had the more recently derived loss figure of 3.5 per cent been used, losses could have amounted to 36 kilograms U-235.

It is possible that the difference, amounting to 21 kilograms U-235 was compensated for through the return of scrap material from other purchase orders closed out before, and during, the 1231 contract. Scrap from the 1231 contract, it can be reasonably surmised, may in turn, have been returned under these purchase orders. Although it is not possible to state that a given amount of 1231 material was returned under another given purchase order, it is nevertheless probable that the net difference - 21 kilograms - (which includes the 9 kilograms discussed above) has, in fact, come to reside in the 1231 contract.

The 1231 contract has become the final repository of these estimated losses through a chain of relatively recent events. It is only within the past year, that through a concerted measurement effort and a reduction in the NUMEC inventory, it became possible to measure with a reasonable certainty, the materials loss experienced at NUMEC. After a close-out of all inactive NUMEC contracts, only the 1231 contract remained as the identifiable point for all other prior misassigned losses.

With respect to NUMEC's over-all facility operation, I believe your analysis will indicate that NUMEC's loss experience is well within the range one might reasonably expect in a facility such as ours. Moreover, our loss experience is probably not significantly higher than that of other facilities of a like nature. Accordingly, the possibility of any diversion of special nuclear material can be discounted with reasonable certainty.

I hope that this information will assist you in your investigation of this matter. Should you desire any further information, please do not hesitate to call on us.

Very truly yours,

S. A. Weber
Accountability Representative

SAW/geo

NUMEC'S COMMENTS AND OUR EVALUATION THEREOF

NUMEC commented on our draft report in a letter dated April 7, 1967, and these comments were further explored with NUMEC representatives in a meeting on April 11, 1967. We were advised that NUMEC's comments, which follow together with our evaluation thereof, were made with the understanding that this report is one of several examining the efficacy of accountability controls at a number of industrial facilities and, therefore, that the conclusions expressed by us are not necessarily unique to NUMEC. The underlined material quoted by NUMEC was included in the GAO draft report submitted to the company for comment.

"(1) '*** NUMEC's past procedures and practices for the accountability of special nuclear material were not sufficiently adequate to identify losses of uranium with specific jobs or process areas or with the period of time in which such losses occurred.'

"This opinion addresses itself to one of two principal facets of a safeguards system; namely, the procedures purporting to control internal movements of material and the mechanisms for reporting thereon. An adequate safeguards system, however, has another significant element - the control of external transactions. (The accountability requirements of 10 CFR 70, as initially published, were basically devoted to control of external transactions. ***.) We believe the record will show that transactions involving the introduction and removal of material from the Apollo plant have, on the whole, been well documented and controlled. Accordingly, we offer for your consideration that the above-referenced statement be amended to read as follows:

'Although the record indicates that external transactions (those involving the introduction or removal of special nuclear material from the Apollo plant) have been reasonably well controlled and documented, in our opinion, NUMEC's internal controls

not consistent with the prudent businessman concept considered by the Commission in formulating its 1955 policy.'

"This statement is unnecessarily vague and susceptible of an interpretation which we do not believe is intended. The report *** notes that the principal underpinning of the Commission's 1955 policy was the expectation that financial responsibility (coupled with the criminal penalties involved) would provide the incentive necessary for individual companies to create and enforce an adequate accountability system. The report then expresses the opinion, noted above, that, at least with respect to internal controls, NUMEC's procedures have, in the past been inadequate. We believe the ultimate conclusion intended *** is:

'Also, it appears that financial responsibility, the essential underpinning of the Commission's 1955 policy decision with respect to materials accountability, failed to provide the expected incentive for the creation and enforcement of an adequate system of internal controls at NUMEC to identify losses of uranium with specific jobs, process areas or time periods.'

"We suggest the foregoing *** as being more accurate and representative of the conclusion intended by the report."

We agree that the use of the term 'prudent businessman concept" in this instance could result in misinterpretation. Accordingly, we have revised this section of the report to more clearly indicate our position.

"(3) '***. AEC records indicate that NUMEC has generally responded to suggestions made as a result of the surveys. However, it appears that NUMEC did not exert the sustained effort necessary to effect and maintain the accountability system improvements necessary for the localization and timely detection of losses.'

"The record, in our view, does not support the conclusion expressed in the second sentence, above. The survey reports

over the past six years repeatedly note 'significant progress,' 'commendable performance' and 'positive cooperation' by NUMEC. Reports to this date, continue to note significant improvements in NUMEC's accountability system. To the extent that deficiencies have been noted from time to time, it must be remembered that an accountability system is not static. As new procedures are employed - and this is particularly true at NUMEC where, as your report notes, 'first of a kind contracts' have been characteristically performed - the accountability system must often be modified. Moreover, certain objectives of a good accountability system, particularly in relation to the localization of losses, pose a never ending challenge. That a recommendation relating to the localization of losses is made repeatedly, is not an indication of a continuing deficiency but rather a call for increased effort to meet a continuously moving target.

"Although many of these points are made elsewhere in your report, we believe they should be included, at least in summary fashion, in the last paragraph on Page 7 [of the draft report] in order to place your statement of opinion in a reasonable context."

As we mentioned in the report, on a number of occasions AEC reports and letters resulting from surveys and visits to NUMEC do comment on NUMEC's progress and attitude in a favorable manner. We agree also that a sound accountability system cannot remain static. In this connection NUMEC should have anticipated the need for and initiated changes to its accountability system to afford proper localization of losses. The record which contains repeated AEC recommendations and suggestions relating to localization of losses seems to indicate that NUMEC did not assume such initiative but, at best, may have at times reacted to the initiative provided by AEC. We believe that the overall record of NUMEC's experience in this area of activity clearly supports the view that NUMEC did not exert the sustained effort necessary to effect and maintain the

accountability system improvements necessary for the localization and timely detection of losses.

"(4) '***. ORO noted in its letter that NUMEC was mixing uranium from several contracts which prohibited commingling, that containers of uranium were not properly labeled, and that NUMEC was not submitting complete and factual material balance reports to AEC.'

"The foregoing summary of the April 1964 survey report is misleading. To the extent it implies a deliberate commingling of material it is in error. The only reference to commingling in the AEC's letter is promptly accompanied by an acknowledgement that such commingling was the result of an inadvertent mis-labeling of a container of material. It should be made clear in your report that NUMEC has not engaged in, and has never been accused of, the unauthorized commingling of material.

"The reference to incomplete or non-factual material balance reports is likewise out of context. The AEC's criticism was aimed at the existence of two internal scrap accounts (one for lease material; the other for station material) of which the AEC was aware but which had not been reflected in the Company's monthly material balance reports. In accordance with AEC's instructions, subsequent material balance reports have reflected these scrap accounts. There was not, however, at any time an attempt to withhold data not already known to AEC. We believe your discussion of the April 1964 survey report should be amended to reflect these facts.

"In the same vein, we would like to request some modest expansion of the paragraph *** outlining the position expressed by NUMEC in its letter of January 18, 1967 concerning, inter alia, the 1964 survey. This paraphrase of our position fails to convey an appreciation of the special problems associated with accountability for materials in scrap recovery operations. We suggest, in the alternative, a direct quote from our letter of January 18, 1967 beginning with the third full paragraph, Page 4 ('A careful review ...) and ending with the paragraph continuing over to Page 5 (... to assure the proper safeguarding of special nuclear material ...')."

We have expanded the report to delineate AEC's findings resulting from its survey of February 1964 and NUMEC's position on the significance of these findings as expressed in a letter dated January 18, 1967. NUMEC concluded that, when considered in the context of current standards and requirements, the findings of the April 1964 survey report would not reflect a determination by AEC that NUMEC's system was inadequate to ensure the proper safeguarding of special nuclear material. It was, however, the opinion of the survey team that NUMEC had expended insufficient thought and effort in the interests of establishing an acceptable and realistic accounting structure for the recording and reporting of special nuclear materials. Moreover, in our opinion, AEC's letter of April 1, 1964, advising NUMEC that:

> "Failure to comply with acceptable scrap processing and special nuclear material accounting procedures may require the AEC to take appropriate action including that which would preclude your receipt and processing of special nuclear materials."

evidenced serious concern over the adequacy of NUMEC's then existing accountability practices as they related to the scrap recovery operations.

> "(5) '*** ORO also advised NUMEC that the percent of material unaccounted for (MUF) disclosed by comparing the adjusted book inventory to the physical inventory was 8.82 percent loss of uranium above 75 percent U-235, 3.19 percent loss of uranium below 75 percent U-235 and 6.01 percent loss of leased nuclear materials. ORO stated that these percentages were in excess of that which was acceptable to AEC.'
>
> "The foregoing, while substantially a direct quote from an AEC letter of October 15, 1964, uses the term 'MUF' erroneously, implying that an 'MUF' is a 'loss.' As your

own report *** correctly notes, MUF is merely a convenient means for expressing the uncertainty on a given inventory. It is not a 'loss' but rather, as you note, 'the result of uncertainties of measurements, unknown losses and undetected errors.' Moreover, in seeking to relate a MUF to the quantity of material handled, it is not meaningful to compare the adjusted book inventory to the physical inventory and then take the difference and express it as a percentage of the adjusted book inventory. The MUF is more properly expressed as a percentage of the total amount of material received or shipped in a given category or under a given contract.

"Based on the foregoing, we suggest that the referenced statement *** be deleted and be replaced by a statement such as:

'ORO also advised NUMEC that the MUFs disclosed by its physical inventory were in excess of that which was normally acceptable to AEC.'"

Because the percentages and terms used in the cited sentence may be subject to misinterpretation, we have revised the sentence in accordance with NUMEC's suggestion. While we do not agree that MUF is merely a convenient means for expressing the uncertainty on a given inventory or that the method used by ORO to arrive at loss percentages is necessarily not meaningful, these matters are no longer pertinent to the section of the report to which NUMEC's comments are addressed.

"(6) '***: The report stated that on the basis of the survey team's findings, the total cumulative loss was established at 178 kilograms U-235 as of October 31, 1965, or 29 kilograms more than had been reported to AEC by NUMEC in periodic reports.'

"This statement, standing alone, carries the inference that NUMEC had understated its losses to the extent of 29 kilograms. It should be noted that the last report made by NUMEC and based on a physical inventory had been

submitted more than six months prior to the date of the above-referenced report. One would naturally expect additional losses in the course of processing additional material over a six-month period. Accordingly, we suggest the deletion of the words 'or 29 kilograms more than had been reported to AEC by NUMEC in periodic reports.'"

We did not intend to imply that NUMEC had deliberately understated its losses but intended only to point out that the AEC survey disclosed significant losses in addition to those previously recognized. To avoid possible misinterpretation we have deleted reference to the additional losses in the report.

"(7) '***: Reference extract of AEC letter of January 24, 1967'

"*** the report extracts three statements of opinion by the AEC regarding the most recent inventory and survey at NUMEC. Briefly, they are:

"a. NUMEC did not maintain complete records of known process losses and losses are, therefore, understated.

"b. Label data were not adequate to provide an accurate inventory.

"c. NUMEC did not include certain filters in its inventory report.

"Your report extracts from a NUMEC letter of January 25, 1967, to AEC a summary of our position with respect to Item 'b' above. It should be noted that our letter also expressed a very clear position with respect to Items 'a' and 'c'. With respect to the understatement of known process losses, we pointed out that extensive data which had already been made available to the AEC on losses through stack and liquid effluent discharges had not been reflected in our reports to the Commission because of our uncertainty with respect to the means of apportioning these losses by contract. We noted, further, that a prorating agreement reached with AEC would eliminate this

problem henceforth. We specifically noted that NUMEC had never failed to report a known process loss which could be associated with a specific contract.

"With respect to Item 'c', it may be well to quote as follows from our letter of January 25, 1967, to AEC in which it is made clear that any failure to report filters on our inventory report was the product of a misunderstanding:

> 'Your opinion notes that there are a number of contaminated air filters stored without a measured content, and that there apparently was a misunderstanding with the AEC concerning the inventory of these items. It was our understanding that the AEC planned, as they had done in November, 1965, to measure all of these filters independently. We regret that a misunderstanding existed regarding the measuring of filters, and we are actively engaged at this time not only in measuring the uranium content of these filters, but in sorting out those which contain recoverable quantities of uranium.'

"We suggest that these facts be included in your discussion of our response to the opinions expressed by AEC as part of its November 1966, survey."

To more fully report on the circumstances resulting in AEC's opinion that NUMEC's stated inventory as of September 30, 1966, did not fairly present actual holdings, we have expanded our discussion of AEC's three stated objections and NUMEC's position thereto.

"(8) '***: During the period of our review, we found that additional losses had been disclosed and NUMEC's records showed that cumulative losses of U-235 through December 31, 1966, have totaled about 260 kilograms, or about 1.2 percent of total receipts.'

"Although we do not believe that the inference is intended, the foregoing statement carries the connotation that earlier loss reports were inaccurate. The difference between the October, 1965, loss estimate of

178 kilograms and the December 31, 1966, estimate of 260 kilograms is almost entirely attributable to losses incurred in processing large amounts of material during the intervening period. This should be made clear in your report."

NUMEC's comment on the additional losses during this period has been incorporated in the report.

"(9) ***." (NUMEC's comments in this section of its letter concern questions of fact as to the sequence of events leading to the settlement of the WANL contract. After reviewing the evidence in our meeting of April 11, 1967, NUMEC representatives agreed that our presentation was in the correct sequence.)

"(10) '***. From our examination of NUMEC's records, we noted that losses reported through April, 1965, were generally not identified as resulting from known loss mechanisms.'

"This is, in large part, a result of our uncertainty with respect to the best means of pro-rating losses through effluent discharge mechanisms. (See discussion under Item (7) above.) The pro-ration agreement recently reached between AEC and NUMEC will eliminate this problem."

The report discusses improvements which NUMEC has made in its practices and those which it has agreed to make. NUMEC's comment in this instance does not appear to require further report amplification.

"(11) '***. Further, under the agreement, NUMEC agreed to pay interest on any amounts unpaid subsequent to December 23, 1965.'

"It may be useful to note that the specified rate of interest was six percent."

In accordance with NUMEC's suggestion we have noted in the report that the interest rate under the supplemental agreement to WANL contract was 6 percent.

"(12) '***. Generally, AEC reports, after detailed surveys, would identify the need for improvements which, in our opinion, indicated serious weaknesses in NUMEC's system. Thereafter, following brief visits, NUMEC would be complimented for the progress being made. Succeeding surveys would thereafter recite problems similar to those disclosed in prior surveys. As an illustration, in October, 1960, AEC's first survey report notified NUMEC of the need to establish controls so as to localize losses; its most recent report, issued to NUMEC in January, 1967, recommended improvements in this area.'

"It is error to cite the record, generally, and specifically, as it relates to the localization of losses, as evidence for the proposition that AEC has been inconsistent in its dealings with NUMEC or that NUMEC has failed to comply with AEC's suggestions for improvements in the accountability system. The objective of localizing losses, as noted above - like so many other aspects of an accountability system - requires continuing effort. That a recommendation of this type is repeated after a lapse of time is neither an indication of inconsistency on the part of AEC nor an indication of fitful or uneven compliance by the Company. Good accountability, whether in the localization of losses or elsewhere, is a never-ending professional challenge. (In this connection, it may be useful to note that our accountability staff is now being increased to 6 full-time professional employees, supported by 7 technicians and clerical personnel.) Suggestions for further improvement, though repetitive on occasion, more often than not reflect changes or refinements in technology and an increasing degree of sophistication in the handling of special nuclear materials. We submit that an acknowledgement of this fact would provide a useful perspective for your report."

NUMEC's comments here are consonant with those contained in point (3) wherein NUMEC stated "That a recommendation relating to the localization of losses is made repeatedly, is not an indication of a continuing deficiency but rather a call for increased effort to meet a continuously moving target."

As mentioned in the report AEC has on a number of occasions complimented and encouraged NUMEC in areas relating to its procedures for accountability. On the other hand, the record shows that AEC has repeatedly cited weaknesses in NUMEC's system, which were continuing in nature and, in our opinion, were serious. For example, as late as April 1966 AEC reported that a recent audit of NUMEC's records confirmed the findings of prior surveys that records which purport to control internal movements of material were incomplete and inadequate; therefore, it was not possible to identify with a high degree of accuracy the true physical losses which were attributable to any given contract.

Consequently, while we agree that a sound accountability system cannot remain static, we believe the overall record of NUMEC's experience clearly supports the view that NUMEC did not exert the sustained effort necessary to effect and maintain the accountability system improvements necessary for the localization and timely detection of losses.

U.S. GAO, Wash., D.C.

2/7--Judge Bell signed the letter to Mr. Staats.

File - NUMEC

SPECIAL ASSISTANT TO
THE ATTORNEY GENERAL

2/6/78

TO: Mike Kelly

RE: NUMEC

I recommend that the Attorney General sign the attached letter to GAO indicating that the NUMEC investigation is still active and thus we cannot yet provide documentary material from our files.

When the investigation is completed two things should be done, which Jack Keeney is already planning to undertake:

(1) Consider what kind of material can be provided to GAO and Congress.

(2) Consider the advisability of a brief public report on this matter.

I have spoken to Jack Keeney about this.

FDB

Frederick Baron

COUNSELOR TO THE
ATTORNEY GENERAL

1/16

Frederick:

Let me have your advice regarding the attached.

[redacted]

File

To : John L. Martin, Deputy Chief
Internal Security Section

Date: February 6, 1978
LRC:gb

From : Benjamin R. Civiletti
Acting Deputy Attorney General

Subject: NUREG Investigation

Attached is a memo from Fred Baron concerning the question of whether to issue a public report at some time concerning this investigation. My last knowledge was that you had received a full report from the FBI and were going to analyze it before making a final decision. Please review with your final decision the question raised by Fred Baron in his memo of January 2, 1978.

cc: J. Michael Kelly
Frederick D. Baron ✓

[illegible]

Don Civiletti
Acting Deputy Attorney General

TO :

DATE: January 7, 1978

Jack Keeney
DAAG/Criminal Division

FROM :

Frederick P. Baron
Special Assistant to the Attorney General

SUBJECT: NUMEC - Investigation

I was recently asked by a reporter whether the Department planned to release any public report upon completion of its investigation of allegations of diversion of nuclear material by NUMEC. I told him there were no such plans and explained the policy considerations that militate against publication of a report on every highly publicized investigation which does not result in prosecution.

Nonetheless I wanted to bring the question to your attention. The allegations which gave rise to this investigation were not only highly publicized but are the subject of continuing Congressional concern. Given the sensitive sources of information and modes of analysis involved in this investigation and the general policy problems with public reports, I am not sure that a report would be appropriate.

I would be interested in your views as to whether a report or a brief public statement about the results of the investigation would be advisable.

cc: J. Michael Kelly
Counselor to the Attorney General

[illegible]

[illegible]

SPECIAL ASSISTANT TO
THE ATTORNEY GENERAL

2/6/78

TO: Mike Kelly

RE: NUMEC

I recommend that the Attorney General sign the attached letter to GAO indicating that the NUMEC investigation is still active and thus we cannot yet provide documentary material from our files.

When the investigation is completed two things should be done, which Jack Keeney is already planning to undertake:

(1) Consider what kind of material can be provided to GAO and Congress.

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I have spoken to Jack Keeney about this.

FDB

Frederick Baron

OPTIONAL FORM NO. 10
JULY 1973 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : Mike Kelly **DATE:** January 9, 1978

FROM : Frederick Baron FDB

SUBJECT: NUMEC Investigation

You asked me to follow-up on the GAO request for information about the NUMEC investigation. I spoke to Jack Keeney, who will respond to GAO both on the phone and by letter to let them know that as soon as the FBI investigation is officially completed he will supply documentary material to them.

5010-110

OPTIONAL FORM NO. 10
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File - NUMEC

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OK
1/9/78

OPTIONAL FORM NO. 10
JULY 1973 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

NUMEC

Memorandum

TO : Ben Civiletti
Acting Deputy Attorney General

DATE: January 2, 1978

Jack Keeney
DAAG/Criminal Division

FROM : Frederick D. Baron FDB
Special Assistant to the Attorney General

SUBJECT: NUMEC - Investigation

I was recently asked by a reporter whether the Department planned to release any public report upon completion of its investigation of allegations of diversion of nuclear material by NUMEC. I told him there were no such plans and explained the policy considerations that militate against publication of a report on every highly publicized investigation which does not result in prosecution.

Nonetheless I wanted to bring the question to your attention. The allegations which gave rise to this investigation were not only highly publicized but are the subject of continuing Congressional concern. Given the sensitive sources of information and modes of analysis involved in this investigation and the general policy problems with public reports, I am not sure that a report would be appropriate.

I would be interested in your views as to whether a report or a brief public statement about the results of the investigation would be advisable.

cc: J. Michael Kelly
Counselor to the Attorney General

Jack Keeney called this week to say that he would begin to provide material to GAO and Congress and he would send a memo to Ben at the time the NUMEC investigation is officially closed, recommending a short public report.

FDB 1/6/78

5010-110

Buy U.S. Savings Bonds Regularly on the Payroll Savings Plan

OPTIONAL FORM NO. 10
JULY 1973 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

File - NUMEC

Memorandum

TO : Benjamin R. Civiletti
Assistant Attorney General
Criminal Division

DATE: Dec. 27, 1977

FROM : J. Michael Kelly
Counselor to the Attorney General

SUBJECT: Nuclear Materials and Equipment Corporation (NUMEC);
August 30, 1977 Letter From Acting Comptroller General

Can you tell me the status of this matter? Has there been an answer to the August 30, 1977 letter referred to in the attached December 16, 1977 letter from the Comptroller General? Could you make sure that both of these letters receive appropriate answers?

cc: Director, FBI
Frederick Baron

bps: Frederick, would you follow up on this?

8010-110

12/22

Mike -

You showed the 8/30 letter to Judge Bell. You sent copies to Messrs. Civiletti and Kelley and asked them to prepare an appropriate response. You sent the original to Frederick and asked him to coordinate the response.

Ida

COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

DEC 20 1977

B-164105 December 16, 1977

The Honorable Griffin B. Bell
The Attorney General

Dear Mr. Attorney General:

This is in reference to the Acting Comptroller General's letter to you of August 30, 1977, requesting access to any records, reports, and files in your possession which are related in any manner to the Nuclear Materials and Equipment Corporation (NUMEC) of Apollo, Pennsylvania. As he explained, access to this data is urgently needed to continue our work which is being done at the request of Congressman John Dingell, Chairman of the House Subcommittee on Energy and Power.

The need for access to these files and records was explained more fully by Mr. Monte Canfield, Jr., Director of the General Accounting Office (GAO) Energy and Minerals Division, and members of his staff at a recent meeting with FBI representatives. However, they learned at that meeting that you had directed the FBI not to allow us access to the documents regarding the NUMEC matter because they relate to an ongoing investigation of a possible diversion of nuclear material from the NUMEC facility. We have also been informed by officials of the Central Intelligence Agency (CIA) that you have requested that they withhold any documents they might have on the NUMEC matter until your work is completed.

We understand, of course, your reluctance to jeopardize the success of your investigation by a premature disclosure of any information you have developed to date. Nevertheless, we are also under considerable pressure to complete our report for Congressman Dingell in a timely manner. Perhaps we can develop a working arrangement whereby we obtain unrestricted access to the records, files, and reports we require, subject to whatever security conditions and release date restrictions you feel are necessary to safeguard your documents. Any such arrangement would, of course, bind us with respect to documents obtained from the CIA as well.

I would appreciate your response to this proposal at your earliest convenience. In the interim, could you please let me know the approximate scope of your investigation and the estimated date it may be completed, in order that we may explain the delay in issuing our report to Congressman Dingell.

The answers to these questions are very important to the timely completion of our investigation. I would appreciate a written response to them at your earliest convenience. Also, I have made a similar request to Admiral Turner and asked for an early reply.

Sincerely yours,

Elmer B. Staats

Comptroller General
of the United States

OPTIONAL FORM NO. 10
JULY 1973 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : Robert L. Keuch
Deputy Assistant Attorney
Criminal Division

DATE: Dec. 5, 1977

FROM : Frederick D. Baron FDB
Special Assistant to the Attorney General

SUBJECT: NUMEC Investigation

The attached memorandum from the Attorney General to Ben Civiletti summarizes the current status of the NUMEC investigation. On that basis your attached draft letter appears to be an appropriate response.

8010-110

OPTIONAL FORM NO. 10
JULY 1973 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : Benjamin R. Civiletti
Assistant Attorney General
Criminal Division

DATE: Dec. 7, 1977

FROM : Griffin B. Bell
Attorney General

SUBJECT: Zalman Mordecai Shapiro
Atomic Energy Act (42 U.S.C. § 2011, et seq.)

I appreciate being advised of your conclusions in this matter.

I agree with your conclusion that the facts contained in your Status Memorandum, which summarizes the findings of the FBI investigation, do not provide a competent basis for prosecution of Mr. Shapiro.

I suggest that before the FBI closes this investigation, the records of the investigation by the Joint Atomic Energy Committee should be examined to determine whether they provide any significant additional facts. I have been informed that Jack Keeney has already taken steps to see that this is done.

Griffin B. Bell

cc: Jack Keeney
Deputy Assistant Attorney General
Criminal Division

5010-110

WITHDRAWAL NOTICE

RG: 65 Records of the Federal Bureau of Investigation

Classified Files of the Special Assistant of the AG, Frederick D. Baron, 1977

NND PROJECT NUMBER: 74857 FOIA CASE NUMBER: 37114

WITHDRAWAL DATE: **09/07/2012**

BOX: 00007 FOLDER: 0 TAB: 10 DOC ID: 31977209

COPIES: 1 PAGES: 19

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

FOLDER TITLE: NUMEC: GAO Investigation

DOCUMENT DATE: 10/17/1977 DOCUMENT TYPE: Memorandum

FROM: Civiletti

TO: Bell

SUBJECT: Zalman Mordecai Shapiro

This document has been withdrawn for the following reason(s):

FOIA(b)(1)

NSI 36 CFR 1256.46

WITHDRAWAL NOTICE

Frederick

Page 7 shows the Joint Committee's investigative attempt by John Conway. Murphy's statement does not comport with this see page 8. I would suggest an attempt to review the Joint Committee's records including Executive Session materials. Otherwise it is good.

Paul

Tony Lapham & NUMEC

Dingell & Senate Comm. Inquiries re NUMEC

~~AG said~~

DCI said requests were coming to CIA

AG said inquiries were better than docs.

DOJ was concerned re producing docs bec FBI investg was pending.

FBI has now terminated its investg below Dingell (to DCI)

If so, Tony thinks we should provide some docs.

Some ex CIA letters to AG beginning 1968 — letters to Hoover asking for investg of various aspects

Tony not sure what these docs are might make some deletions.

NUMEC : Paul Daly

(1) The FBI hasn't reviewed the Jt. Comm Atomic Energy records. If not, then George Murphy will yell. He got Shapiro (+ other officials) to testify + this needs to be contrasted w/ FBI records.

(2) + At least we need to be on record that FBI asked for Jt Comm material bec. Baker knows that it contrasts.

(3) Mellon Bank in Pittsburgh refused FBI access to materials. Seventh of ? bank records, an Israeli fellow for bks, who financed ~~NUMEC~~ Shapiro (NUMEC) at time when Shapiro was in bad financial straights.

Tell DCI to tell Dingell that the investig isn't completed.
Ask ERIC to call Dingell + ask him to hold off.

(1) The FBI hasn't reviewed the Jt. Comm records. If not, then George Murphy will yell. He got Shaguin (+ other officials) to testify + this needs to be contrasted w/ FBI records + At least we need to be on record that FBI asked for Jt Comm material bec. Baker knows that it contrasts.

(2)

(3) Mellon Bank in Pittsburgh refused FBI access to materials. Seventh of the bank records. an Israeli fellow [illegible] who ~~[illegible]~~ financed ~~NUMEC~~ Shapiro (NUMEC) at time when Shapiro was in bad financial straights.

Tell DCI to tell Dingell that the investig. isn't completed
Ask ERIC to call Dingell + ask him to hold off.

File - NUMEC

Office of the Attorney General
Washington, D. C. 20530

November 10, 1977

Honorable Howard H. Baker, Jr.
Minority Leader
United States Senate
Washington, D.C. 20510

Dear Senator Baker:

I appreciate your October 25 letter informing me of the transfer of the Senate files on the sensitive atomic energy matter from the Office of Classified National Security Information to the Senate Select Committee on Intelligence.

I have sent a copy of your letter to the FBI and want to assure you that we are continuing to monitor this matter very closely.

We look forward to continued cooperation between the Justice Department and the Senate Select Committee on Intelligence.

Yours sincerely,

Griffin B. Bell

Griffin B. Bell
Attorney General

HOWARD H. BAKER, JR.
TENNESSEE

United States Senate

OFFICE OF THE MINORITY LEADER
WASHINGTON, D.C. 20510

October 25, 1977

Honorable Griffin Bell
Attorney General
Department of Justice
Washington, D.C. 20530

Dear Mr. Attorney General:

On March 2 and August 4 of this year, I wrote you concerning an extremely sensitive atomic energy matter that came to my attention while serving on the Joint Committee on Atomic Energy. The United States Senate files relating to this subject have been in the custody of the Office of Classified National Security Information, which is under the policy direction of the Majority Leader and the Minority Leader. On October 19, 1977, the Leadership transferred Senate jurisdiction of this matter to the Senate Select Committee on Intelligence.

As this matter remains of interest and concern to me, I am writing to apprise you of this recent development and to urge your ongoing cooperation with the Select Committee.

Sincerely,

Howard H. Baker, Jr.

HHBJr:sp

File - NUMEC

OFFICE OF
THE ATTORNEY GENERAL

- MO UDALL - NUMEC

- FBI briefed him yesterday on the case.
- Someone knowledgeable on the case should talk to Udall on the policy problems.
- The investigation is still pending.
- The decision is to be made by Udall. No reason to think that merely holding the hearing will per se compromise the investig. But some info could be harmful & must be careful.

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UNITED STATES GOVERNMENT

Memorandum

TO : Clarence M. Kelley, Director
Federal Bureau of Investigation

DATE: Sept. 12, 1977

FROM : Benjamin R. Civiletti, Assistant Attorney General
Criminal Division
Frederick D. Baron FDB
Special Assistant to the Attorney General

SUBJECT: NUMEC: GAO Investigation

On August 31, 1977, Mike Kelly sent to the FBI and the Criminal Division copies of a letter of August 30, 1977 which the Attorney General received from the Acting Comptroller General of the United States. (A copy of the letter is attached.) This letter indicated that Congressman John Dingell, Chairman, Subcommittee on Energy and Power, House Interstate and Foreign Commerce Committee, has requested GAO to investigate allegations of the diversion of highly enriched uranium from NUMEC in Apollo, Pennsylvania.

The letter from GAO requests access to records, reports, and files of the Justice Department "which relate in any manner to NUMEC since 1965."

Mike Kelly has asked me to coordinate a response by the Department to this letter. I would appreciate it if you would let me know who, in your respective offices, is working on responding to the GAO letter, so that we can amalgamate the responses into one letter to GAO.

cc: Ann Collins
Office of Legislative Affairs

5010-110

OFFICE OF
THE ATTORNEY GENERAL

9/2/77

TO: Frederick Baron

FROM: Mike Kelly

Would you work with Criminal and the FBI in preparing a response to this letter?

COUNSELOR TO THE
ATTORNEY GENERAL

August 31, 1977

TO: Judge Bell

FROM: Mike Kelly

The attached memorandum is being sent to Ben Civiletti and Director Kelley.

MK
GBB
9/1/77

COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-164105

August 30, 1977

The Honorable Griffin B. Bell
The Attorney General

Dear Mr. Attorney General:

Over the past 2 years, the General Accounting Office has been heavily involved in the area of nuclear safeguards. Recently, we have been requested by Congressman John Dingell, Chairman, Subcommittee on Energy and Power, House Interstate and Foreign Commerce Committee to investigate events pertaining to the Nuclear Materials and Equipment Corporation (NUMEC) of Apollo, Pennsylvania. In 1965, NUMEC experienced inventory differences of large quantities of highly enriched uranium and considerable concern has since been voiced that this material could have been diverted to a foreign country for use in nuclear weapons.

Chairman Dingell has requested that we:

> "* * * initiate an immediate and comprehensive investigation to determine the extent and contents of intelligence and safeguard information regarding a possible diversion of highly enriched nuclear material from NUMEC and the extent to which this vital information was provided to ERDA and NRC for their use in assuring the protection of nuclear materials in this country. In this regard, I specifically request that you review all necessary files and reports, including those of ERDA, NRC, CIA, and the FBI, which are related in any way to the alleged NUMEC diversion, and to provide this Subcommittee with your assessment. The Subcommittee is considering holding hearings on this matter and would appreciate a report by December 1, 1977."

In order to satisfy Chairman Dingell's request, we will need to review and have access to those records, reports, and files in your possession which relate in any manner to NUMEC since 1965. Mr. John Clynick of your department told us that we would need your approval in order to gain access to the NUMEC information. Since we are required to investigate, complete, and prepare a report to Chairman Dingell by December 1, 1977, we would appreciate your earliest attention and response to our need for access to your NUMEC files.

If you require further information on this matter, please contact Ralph V. Carlone (353-3711) or James L. Howard (443-2876).

Sincerely yours,

R. F. Keller

Acting Comptroller General
of the United States

COMPTROLLER GENERAL
OF THE UNITED STATES
WASHINGTON, D. C. 20548

OFFICIAL BUSINESS

The Honorable Griffin B. Bell
The Attorney General

REFERENCE SERVICE SLIP

DATE: 1/23/13

NO.

NAME OF REQUESTOR: Grant Smith

AGENCY OR ADDRESS:

UNITS OF SERVICE

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