

PACE

Local 5-689

PAPER, ALLIED-INDUSTRIAL, CHEMICAL AND ENERGY INTERNATIONAL UNION, AFL-CIO

April 27, 2004

U. S. Department of Health and Human Services
National Institute for Occupational
Safety and Health (NIOSH)
Robert A. Taft Laboratories MS-C34
4676 Columbia Parkway
Cincinnati, OH 45226

Dan Minter, President
Bill Dimit, V. Pres.

P. O. Box 467
Piketon, OH 45661

Delivery Add: 2288
Wakefield Mound Rd

PH: (740) 289-2405
FAX: (740) 289-2126

E-Mail:
paceport@zoomnet.net

TO WHOM IT MAY CONCERN:

Thank you for taking the time to make a presentation to the Portsmouth Unions regarding our Site Profile being developed and requesting our suggestions and information. Our crew is very anxious and are standing ready to assist NIOSH in developing this Site Profile before our claims are adjudicated. We submitted the information we have presently accumulated, but will continue to assist in developing this Site Profile.

It was alarming to us to learn that your Profile is based only on information after 1985, due to the lack of information provided to you. Another potential detriment is having to rely on newly hired Health Physics personnel who may not have the history/knowledge of the Plant for the information prior to 1993.

As discussed in the meeting, another area of concern is that the individual's history is not being captured to the fullest extent. This is because the claimants are unaware of what may be extremely important to you in order to assist them and the interviewer who is not knowledgeable of the practices, systems, etc., at the Plant.

The percentage of the time the doses were assigned, as to specific information on the types of work performed as well as in depth information of the buildings (i.e. the X-770) would all be very important. We do not feel anyone could capture the chronic exposure. The urinalysis information has the potential to be more in error than the badge information; since the urinalysis Program has been significantly modified a number of times over the years.

There are an estimated 100 personal interviews that Dr. Michaels conducted on our Site assessment that NIOSH would have access to that would prove to be very helpful, as well as available congressional testimony available on the website.

Access to IMBA to determine the dose estimates and basis for the dose calculations would be helpful, as well as training to key individuals would server to be very beneficial.

Acc'd
4/30/04

The assurance that the 32 or more PORTS NIOSH decisions could be re-evaluated, if the Site Profile development or any other information could impact those decisions should make claimants feel a little better about having to sign the OCAS form and go through the closing interview process knowing the information is still forthcoming.

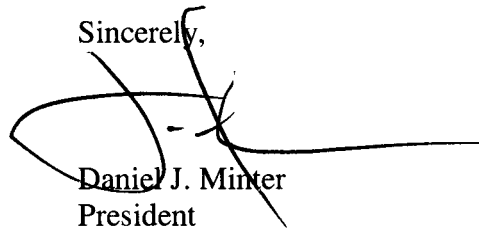
During the meeting, a number of potential items and situations were identified that would assist in your function of dose reconstruction. We feel that this information may provide the evidence that accurate dose reconstruction is not possible. We ask that these recommendations be part of your dose reconstruction assessment.

We requested that you determine the percentage that the personal and environmental badge results were assigned or missing. Our historical knowledge leads us to believe that a large percentage of the badges were assigned a dose or labeled as missing. The process of assigning doses was not consistent and does not seem to be as technically sound as NIOSH would expect. Providing us that information would be appreciated.

We also requested that you look into operational documentation that may contain information that would identify potential exposures that may have not been well documented in the health and safety data. This information included, but not limited to, the procedures and logbooks related to the radiation clusters, the argon gammagraphs, classifying of removed process equipment, monitoring of deposits in the cascade (RASCAL) readings, and special cascade projects.

We offered to assist you in specifically identifying which of this data would be helpful. Please let us know when you wish to visit the plantsite to collect this information.

Sincerely,

A handwritten signature in black ink, appearing to read "Daniel J. Minter", is written over a horizontal line. The signature is stylized and somewhat illegible due to the cursive nature of the handwriting.

Daniel J. Minter
President

Cc: Advisory Board

INTRODUCTION

In the late 1990's, the Department of Energy (DOE) admitted that nuclear workers had been put in harms way during the Cold War. (Cold War Veterans)

In 1999, congressional hearings were held in the Senate and the House of Representatives. As a result of these hearings, Congress passed and the President signed the "Energy Employees Occupational Illness Program Act of 2000" (EEOICPA). Part of this act deals with dose reconstruction for nuclear workers who have contracted cancer. Site profiles are an important ingredient in helping NIOSH in their effort to do dose reconstruction.

In order to have a valid profile, we need to understand what transpired to bring the EEOICPA into existence. To do this, we need to look at the nuclear industry since its inception.

CLOSING THE CIRCLE ON THE SPLITTING OF THE ATOM

"THE MANHATTAN PROJECT"

"The quest for nuclear explosives, driven by the fear that Hitler's Germany might invent them first, was an epic, top-secret engineering and industrial venture in the United States during World War II. The term "Manhattan Project" has become a byword for an enormous breakneck effort involving vast resources and the best scientific minds in the world. The workers on the Manhattan Project took on a nearly impossible challenge to address a grave threat to the national security."

"From its beginning with Enrico Fermi's graphite-pile reactor under the bleachers of Stagg Field at the University of Chicago to the fiery explosion of the first atomic bomb near Alamogordo, New Mexico, the Manhattan Project took a little less than 3 years to create a working atomic bomb. During that time, the U.S. Army Corps of Engineers managed the construction of monumental plants to enrich uranium, three production reactors to make plutonium, and two reprocessing plants to extract plutonium from the reactor fuel. In 1939, Nobel Prize-winning physicist Niels Bohr had argued that building an atomic bomb; can never be done unless you turn the United States into one huge factory." Years later, he told his colleague Edward Teller, "I told you it couldn't be done without turning the who country into a factory. You have done just that."

-from pages 1, 2, 38, 39, 81

April 2, 1948 - **REPORT OF THE SAFETY AND INDUSTRIAL HEALTH ADVISORY BOARD**

"The Atomic Energy Commission isolated its projects, built plants which are a marvel of engineering and guarded them with extraordinary efficiency. Their sins of emission-liquid, solid, or gaseous-were diluted and isolated to what was estimated as perfectly safe, but AEC is now entering a phase in which their operations in this regard will soon be public property and they will be accountable to public health-a very severe critic...

In the haste to produce atomic bombs during the war certain risks may have been taken in research, production, testing, transportation and waste disposal with the understanding that subsequently

more effective control measures would ameliorate these risks and lessen the hazardous conditions formerly created...

The ultimate disposal of contaminated waste—subsurface, surface and airborne—needs much more thorough study. Even the simplest of such data-recorded periodic measurements of stream pollution below the plants are almost wholly lacking. Even with such records, present knowledge of radiation and chemically toxic effects on animal and vegetable life is so limited that water supply inlets below plant disposal outlets cannot be unqualifiedly recommended. The disposal of contaminated waste in present quantities and by present methods (in tanks or burial grounds or at sea), if continued for decades, presents the gravest of problems.”

-from pages 8, 9, 64, 67

“THE EVOLUTION OF HEALTH PROTECTION STANDARDS FOR NUCLEAR WORKERS”

“1950 Scientists discard the idea of a “maximum permissible exposure,” recognizing that any amount of radiation may be dangerous. Radiation protection scientists recommend that exposure be “as low as reasonably achievable.” Concern over latent cancer, life shortening, and genetic damage also causes standards to be halved: 0.3 rem per week (15 rem per year).”

“1990 The National Academy of Sciences BEIR V report asserts that radiation is almost nine times as damaging as estimated in BEIR I. Annual doses may no longer exceed 5 rem per year. The International Commission on Radiation Protection recommends that an average dose of 1 or 2 rem per year not be exceeded.”

“RADIATION AND HUMAN HEALTH”

“Its potential for commercial and medical benefits, and its health risks became quickly apparent.”

“At lower doses, radiation can damage DNA, sometimes leading to cancer or genetic mutations.”

“In general, the risks of adverse health effects are higher when exposure is spread over a long period than when the same dose is received at one time.”

“NEED TO KNOW”

“In the interest of national security, nuclear weapons workers generally knew only their particular jobs. As the Atomic Energy Commission said of the Manhattan Project:

“Just as a man-of-war was compartmentalized to prevent a single torpedo from sending the vessel to the bottom, the (Manhattan Project) had been subdivided to prevent some indiscreet or disloyal individual from revealing the whole enterprise to the enemy.”

“The Atomic Energy Commission used these words to describe the system wide compartmentalization of knowledge deemed essential to building the first atomic bombs. The intentional narrowing of the field of knowledge, commonly called the “need-to-know” principle, asserts that there is no real need for individuals to have information beyond the minimum needed for their jobs. This approach to security pervaded the complex during the Cold War.”

“Knowledge of the whole picture is crucial to environmental cleanup. A narrow focus can hinder progress. It is now common practice in most industries to identify wastes that come from each part of a process and to determine how best to minimize or prevent their generation. If it did not understand these connections, the Department of Energy could create other problems while attempting to resolve the original concerns. For example, how should the Department manage new wastes that will be created from cleaning up contaminated soil, water, and buildings?”

“FROM SECRECY TO OPENNESS”

“During the Cold War, a large amount of information about the nuclear weapons complex, including information on issues related to the environment, safety, and health, was withheld from the general public because of concerns about national security.”

“TWO STATEMENTS BY JOHN GLENN, U.S. SENATOR, STATE OF OHIO”

“1985: Hearing of the Governmental Affairs Committee, U.S. Senate, in Cincinnati, Ohio:

“Although most of us have become aware of the problems at Fernald only recently, the situation has existed for three long decades. And although we may not be able to do anything about the past releases of radiation from the plant, I strongly believe that the public has a right to know about such releases.”

“We must see to it that what happened in the past is never repeated. . . . I’m fully aware of the economic and national security benefits the plant provides, but, as I said when I toured Fernald last month, while plants like Fernald are essential to the security of our country, we must see to it that the cost of that security does not include the health of our people.”

“1994: Confirmation hearing before the Governmental Affairs Committee, U.S. Senate, for Alice Rivlin as Director of the Office of Management and Budget:

“In 1985, the people at Fernald in Ohio wanted me to come out. They had problems there. I went out, not knowing how valid their concerns were, and found that they were very valid. We did General Accounting Office (GAO) studies then of the other spots in the nuclear weapons complex all over the country, some 11 States and 17 different major sites. Cleanup had been put away at that time. ‘The Russians are coming; we have got to produce.’ ‘What are you going to do with the waste?’ ‘Put it out behind the plant.’”

“...When we started this, the General Accounting Office estimated that to clean up the whole weapons complex was somewhere between \$8 to \$12 billion. Now the latest GAO estimate is \$300 billion, if we can figure out how to do some of it, and over a 20- to 30-year period....I am concerned about how we take care of these long-term items that are going to require a year-by-year effort---Cleanup is not going to get cheaper as we go along and it is something that does have to be done because of the danger to our communities.”

TESTIMONY OF SAM RAY
BEFORE THE
COMMITTEE ON GOVERNMENT AFFAIRS
U.S. SENATE
MARCH 22, 2000
REGARDING HISTORICAL WORKING CONDITIONS
AT THE PORTSMOUTH, OHIO GASEOUS DIFFUSION PLANT AND REMEDIES
NEEDED TO ADDRESS THE HEALTH OF DOE NUCLEAR WORKERS

I am Sam Ray, a former uranium enrichment worker at the Portsmouth Gaseous Diffusion Plant in Portsmouth, Ohio. I reside at 128 Overlook Drive, Lucasville, OH.

I was hired in 1954 and worked as a production operator and instrument mechanic. In May of 1994, I was diagnosed with a rare type of bone cancer: chondrosarcoma. As a result, I had to have my larynx removed. At that point, I had no option but to take a disability retirement. My understanding is that there are two things that can cause my type of cancer. One is Paget's Disease, which I didn't have, and the other is radiation exposure, which I did have. I have never smoked a day in my life. It is well documented that certain uranium compounds are bone seekers.

Your Committee's hearing is especially timely. The Administration has proposed legislation to compensate workers nationwide from beryllium, and a remedy for radiation-related cancers at the Paducah Gaseous Diffusion Plant in Paducah, Kentucky. However, uranium enrichment workers exposed to radiation at Portsmouth and Oak Ridge were left out of the Administration's bill. We hope you will make sure Portsmouth and Oak Ridge workers are not left out of the final legislation. I believe my testimony illustrates how we toiled under conditions no less hazardous than Paducah.

1. PORTSMOUTH FAILED TO PROVIDE WORKERS WITH ADEQUATE PROTECTION FROM RADIATION, HEAVY METALS & TOXIC CHEMICALS

In prosecuting the Nation's cold war mission, workers at Portsmouth were kept in the dark about the hazards they faced. Information was provided based on a "need to know" basis-- and production imperatives determined what you needed to know. Even to this day, we don't know what we confronted. For example, when we started feeding irradiated recycled uranium back into the process system, we never knew we were introducing contaminants (e.g., technetium, plutonium, neptunium, etc.), nor were we adequately protected. Today we are still learning about the extent to which transuranic elements, such as plutonium, were part of the working environment.

A. THE PORTSMOUTH OXIDE CONVERSION PLANT (705-E) CAUSED NUMEROUS INTERNAL RADIATION DOSES

Portsmouth operated a facility that converted highly enriched uranium (HEU) oxides into feed material from 1961-1978. Much of this HEU oxide (87% enriched) was shipped in from the Idaho Chemical Processing Plant, and processed in the 705-E building.

A good friend of mine, Robert Elkins, worked in the oxide plant from 1962-65. By 1965 he was placed on permanent work restriction due to high internal body counts of radiation. He had enriched uranium, technetium-99, neptunium-237, potassium and cesium in his body. When he retired in 1985 he was still on permanent restriction, a situation that confronted many other oxide plant workers. In the 15 years since retirement, the plant management has never contacted him to check on his health or suggest that he receive post-retirement monitoring.

However, Mr. Elkins was contacted by an individual from Hanford, WA (presumably the transuranium registry) who wanted to pay him \$500 for his body so the government could study what happened to the radiation in his body after he passed away. He wife was also offered \$500.

They both declined the offer. It appears that the government is more interested in what happens to Mr. Elkins after he is dead than what happens to him while he is still alive. If the Congress is funding this kind of effort, perhaps it could reorient the Department of Energy's priorities toward caring for the living.

Mr. Elkins' over exposures to radiation were not the exception, it appears. A 1985 DOE report states¹:

"the oxide conversion facility was not able to maintain adequate containment of the radioactive materials during operating periods."

"As such, the decision was made in the 1977 time frame to shut down that facility pending modifications to provide adequate containment measures. These modifications were never funded, and the facility has not operated since."

In vivo body counts (a relatively insensitive method of measuring the amounts of radiation in the lung) taken after 1965 found eight employees with radiation counts above DOE's 15 rem lung standard and two employees had more than 7.5 rem (half of DOE's standard). Since 1972, another 7 were found with more than 7.5 rem.² Of the 17 employees listed above, 11 had worked in the oxide conversion facility. This number of overexposed workers actually measured and reported by Goodyear Atomic underscores the point that workers in the oxide conversion facility were subjected to uptakes of excessive levels of radiation.

B. NEUTRON DOSES WERE NOT MEASURED BETWEEN 1954 AND 1992

¹*The Report of the Joint Task Force on Uranium Recycle Materials Processing*, Department of Energy, 1985, DOE/OR-859

²*Information on Three Ohio Defense Facilities*, Fact Sheet for the Ranking Minority Members, Subcommittee on Energy, Nuclear Proliferation and Government Processes, Committee on Governmental Affairs, U.S. Senate, November 1985, GAO/RCED-86-51 FS.

The Portsmouth plant's radiation dosimetry programs have been woefully inadequate. For example, NIOSH discovered that between 1954 and 1992 the site never measured for neutron exposures. Worker dose records, consequently, do not exist for neutrons. "Slow cooker" effects from the concentration of uranium deposits in the cascade causes neutron emissions. Workers called in to clean out "freeze ups" of uranium inside of the cascade would be particularly at risk from neutrons, but there are no recorded doses to document these exposures.

C. **WORKERS INGESTED TECHNETIUM-99--A BETA EMITTER**

Technetium-99, a fission product, was introduced into the cascades from recycled uranium reactor tails, most which had been first processed at Paducah. Worker urine dose records from CY 1976, 1977 and 1978 indicate that 27% of the chemical operators at Portsmouth tested positive for technetium-99 (66% tested positive for uranium)³. *In vivo* lung monitoring established that 2 of the 45 maintenance mechanics had positive confirmed doses of technetium-99 to the lungs. Curiously, 563 mechanics were tested for uranium over a three year period, but only 45 were tested for technetium-99 or neptunium-237. Depending on whether the Tc-99 was in a vapor or solid form, special personal protective equipment (such as supplied air respirators) was required, but not provided until the early 1980s. One pregnant worker had a calculated dose 800 millirem to the fetal thyroid⁴ of her 10-11 week old fetus, providing further evidence of inadequate worker protection. Amazingly, between 1954 and 1993, the site had no technical

³ Response to Freedom of Information Act Request by OCAW to the DOE, July 1, 1982.

⁴ A July 22, 1976 letter from Karl Hubner, Oak Ridge Associated Universities to E.V. Hansen, Goodyear Atomic, states: "The dose of .8 to 1.0 rad to the thyroid gland of a fetus is considered to be insignificant, and there is no reasonable chance of damage to this organ in terms of cretinism." The letter qualified this conclusion by stating: "calculations were based on some gross assumptions that had to be made because of insufficient data."

basis document for rad protection, which would have included the protocols for conducting a monitoring program for transuranics.

D. CONTAMINATION CONTROLS WERE NON EXISTENT OR WOEFULLY INADEQUATE UNTIL THE 1990S

When I was hired in 1954, process operators were not allowed to wear coveralls or safety shoes. If clothing became contaminated, we took this contamination home with us on our clothing and shoes. To my knowledge, all crafts (such as electricians, maintenance mechanics, etc) were allowed to wear coveralls and safety shoes. Some were mandatory. Sometime in the 60's, coveralls became optional for process operators; however, it wasn't until the 90's when contamination controls were implemented that they became mandatory. In reality, they should have always been mandatory.

E. DOSE RECORDS HAVE BEEN 'ZEROED' OUT OVER LIABILITY CONCERNS

As others will testify today, management directed that a guard's radiation dose records be "zeroed" out after he had an uptake and was hospitalized, because of the concern that he would bring a worker comp claim. We have no idea if this was an isolated case or a regular management practice.

F. RADIATION DOSES WERE ARBITRARILY "ASSIGNED" (INSTEAD OF BEING COUNTED)

OSHA was called into Portsmouth after complaints filed by the Oil, Chemical & Atomic Workers Union (OCAW) and the Guards union questioned the accuracy of radiation doses. Management directed that doses be administratively "assigned" when the health physics staff had trouble reading dose badges. One practice involved pinning a dose badge to the wall and running a scanner over it and assigning this dose to any person whose dose badge didn't read out on a

scanner. A settlement of this OSHA complaint resulted in a reconstruction of doses between 1993-1995. While management was generally conservative in assigning doses, at least 103 doses were undercounted. We have no idea how far back management was simply administratively "assigning" doses, instead of counting them.

Historically, the Health Physics program did little to investigate high radiation doses, based on the philosophy that high doses were unlikely. Whenever high dose readings were found on badges, they were determined to be equipment failures and summarily discarded. DOE has historically claimed no responsibility for the deficient health physics program and poor record keeping.

G. CHEMICAL OPERATORS WERE OVEREXPOSED TO MERCURY AND ARSENIC

Between 1981 and 1990, decontamination workers in the X-705 (decontamination process) building were exposed to mercury at up to 175 times the OSHA threshold limit values, largely from open vats of solvents. A 1990 DOE investigation found "workers were exposed at least once per shift, after sodium hydroxide was added tanks" and that Martin Marietta's plant doctor trivialized the hazards of ingesting mercury in discussions with affected employees.⁵

Arsenic contaminated feed was fed into the Portsmouth cascades in the late 1980's. Arsenic migrated towards copper instrument lines causing them to plug up. In 1993 after the presence of inorganic arsenic was confirmed, NIOSH conducted a health hazard evaluation. Air samples detected arsenic in excess of OSHA limits.

H. RESPIRATORY PROTECTION DEPENDED ON WWII-ERA GAS MASKS FOR MANY YEARS AND CONTAMINATION WAS WIDESPREAD

I worked at the Extended Range Product (ERP) station on and off for a number of years.

⁵ Letter from Gene Gillespie, Site Manager, DOE to Ralph Donnelly, Plant Manager, Martin Marietta, July 20, 1990, Letter EO-221-696.

On one occasion while connecting the production process into an empty cylinder, the copper tubing pigtail ruptured. Although I immediately valved off the system, the room was filled with a thick fog of uranium oxide gases. I donned an army assault mask for protection. After the all clear signal, management sent me to the hospital for urinalysis. Today, we know that you should wait for 3-4 hours to give the material time to get into your system before urinalysis. For that reason, my dose records from this accident is going to be suspect, at best.

Indeed, until the mid 1970's, our respirator protection consisted of World War II army assault masks. It was years later that we learned that these were not adequate to block radionuclides or toxic chemicals.

In the late 50's and early 60's we had big layoffs. Prior to this layoff, the lab took samples to make sure process gases were reduced to a safe level before opening up the process equipment for maintenance work. In the process buildings, operators had to take over the work of lab technicians. Previously, the lab techs used bulb samples that would be taken to the lab and analyzed. The new system consisted of pulling a sample through a tube of salicylic acid (white powder). If the powder didn't change color in three (3) minutes, then it was assumed the system was <10 ppm UF6 (commonly called a "negative").

We now know this was never an approved method, and there wasn't adequate research. In turn, we put maintenance crafts and others in harm's way when we issued a hazardous work permit stating that system was at a "negative".

I. **WORKERS WERE KEPT IN THE DARK ON CONTAMINATION CONTROLS**

Early on, we were told that the buildings would be so clean, we could eat off the floors.

In reality, some eating areas became so contaminated that management had to build designated

lunch rooms that were surveyed on a regular basis and kept clear (1980's).

Due the lack of a contamination control program, certain buildings were becoming more contaminated. For example, leaks from the ERP station had spread contamination in the X-326 building. Compressors would malfunction and process gases (UF₆) would leak to the atmosphere. On ONE occasion, it was so bad that it looked like a fog moving up the building, which is approximately ½ mile long. I became personally aware of this contamination problem when working as an instrument mechanic, because we had to work in areas that we knew or suspected were contaminated. I often felt we should have surveys, but at the time it was a hassle to get your supervisor to request a survey. Today, the story is different.

We have had many small releases which were never reported, as well as documented large releases. In side of the withdrawal room we a major release. There were green "icicles" hanging in the room from crystalized uranium hexaflouride. Management had declined to install safety measures to prevent this release.

Goodyear Atomic issued a *Health Physics Philosophy as a Guide for Housekeeping Problems in the Process Areas*, which it distributed to all supervisors on August 27, 1962.

While management assured workers there was no hazard at the uranium enrichment facility in Portsmouth, Ohio, it warned supervisors:

"We don't expect or desire that the philosophy will be openly discussed with bargaining unit employees. Calculations of contamination indices should be handled by the General Foreman and kept as supervisory information in deciding the need for decontamination."

Until the 1980's, there were few or no personal radiation monitors (frisking devices). This technology was available, but apparently for DOE the cost outweighed the risk. In the 90's,

this all changed. Today, in certain buildings and areas, you have to monitor clothing and shoes whenever you leave the building to make sure you aren't tracking radiation into clean areas or off plant site. Primarily, the problem lies in the first 35 years. What were the former workers exposed unknowingly or perhaps even knowingly? We know that they are having many health problems, such as cancers and respiratory problems, and in numbers far greater than would be expected.

2. INSPECTIONS WERE INFREQUENT UNDER DOE'S SELF REGULATION

A July 1980 Comptroller General report, *Department of Energy's Safety and Health*

Program for Enrichment Plant Workers Is Not Adequately Implemented (EMD-80-78), found that DOE's Oak Ridge Office, which had oversight responsibility for health and safety, had not conducted a safety inspection at Portsmouth for 3 years and was not adequately responding to worker safety complaints. Unannounced safety inspections were supposed to occur annually at each plant, but even when they were inspected, the Oak Ridge Office "does not, as part of an inspection or any other visit to an enrichment plant, monitor for radiological contamination." Oak Ridge explained the absence of inspections on a staff shortage, which the Comptroller General noted was attributable to Oak Ridge paying safety inspectors at a lower grade than elsewhere in the DOE complex.

3. HEALTH EFFECTS ARE ON THE MINDS OF MANY CURRENT AND FORMER WORKERS

Currently, I am a retiree representative for the Worker Health Protection Program (WHPP). This program is funded by a grant authorized under Section 3162 of the FY 93 Defense Authorization Act, and administered by Queens College and the Paper, Allied-Industrial, Chemical & Energy Workers Union ("PACE"). It gives former workers a one-time complete

physical. When I talk to former workers and retirees, I find out how little they knew about what they were exposed to. I get calls from widows whose husbands have passed away with cancers. They want to know if their spouse's exposure in the workplace caused their illness.

In 1987 NIOSH reported that Portsmouth workers had experienced excess stomach cancer and hematopoietic cancers (including leukemia). In 1992 the study was updated, in part, due to a request from Senator John Glenn. In 1996, the study summary was presented to the workforce. It indicated that there were no statistically significant elevations of any cancer deaths and the elevations of stomach and hematopoietic cancers identified in the 1987 study had diminished. These results were presented to the media in September 1999⁶. However, the NIOSH officials releasing this information apparently chose to DELETE the page defining the study's limitations⁷, which includes (1) this was a mortality study and not a study of disease

⁶ *Portsmouth Gaseous Diffusion Plant: Study Summary*, Rinsky, Ahrenholz, and Cardarelli, September 1999

⁷ Restated below are portions that were deleted by NIOSH before releasing the summary:

"All observational epidemiologic studies have some limitations since they take advantage of naturally occurring events rather than being conducted in an experimentally controlled environment. Here are the biggest limitations that we know about:

1) This is still a very young population and the vast majority of them are still alive. As the workforce grows older, deaths will occur at an increasing rate and of course there is no way to know what these people will eventually die from;

2) this is a study of mortality, not disease incidence. Only diseases that have high case fatality rate are measured well by mortality. Although most cancers have a high case fatality rate, there has been great progress over the past two decades in prolonging the life of persons with hematopoietic cancers. Mortality may not be a good measure of these deaths;

3) SMR analyses are not particularly good attributing the proper effects of confounding and effect modification. The case control studies that are being worked on are much better in this regard;

4) the exposure response portion of these analyses are only as good as the exposure metrics. Because of the way the plant collected exposure data our algorithms for assigning exposure, while the best that can be done, still have a degree of uncertainty To the extent that real exposures are over or under estimated, our answers will be in

incidence; (2) the population is still relatively young to conduct an epidemiology study; (3) case control studies would be better at identifying cause and effect; (4) the exposure data is weak; and (5) workers were exposed to a mix of chemicals and radiation and the effects are difficult to disentangle. We obtained the deleted text. These limitations, if incorporated, substantially alter the light in which the findings should be considered. What motivated this apparent censorship is beyond our knowledge.

4. RECOMMENDED ACTIONS FOR CONGRESS

- **Congressman Ted Strickland and 10 cosponsors introduced HR 3495 to provide workers' compensation for radiation exposed workers at DOE nuclear facilities and suppliers. It lays down important marker, because, unlike the Administration's bill (HR 3418 and S 1954), it expands coverage beyond the Paducah workforce and 55 workers in Oak Ridge to cover the entire DOE nuclear complex.**
- **Any successful bill must shift the burden of proof to the government in determining causation, because the failure to properly monitor for radiation and toxic hazards imposes an insurmountable burden of proof on a victim. Dose reconstruction is very costly, takes years to accomplish and the results are questionable at best since basic data was never collected in many cases. NIOSH noted in a 1993 report, that "prior to 1981, the amount of quantitative industrial hygiene data is scant to non existent."⁸**
- **A single agency, such as the Labor Department's Office of Worker Compensation Programs, should administer a federal workers comp program. We need one stop shopping for addressing occupational illnesses regardless of whether it is beryllium, radiation, toxic chemicals or heavy metals.**
- **The current medical screening program carried out by DOE under Section 3162 of the FY**

error; and finally,

5) these workers were simultaneously exposed to a number of chemical and physical agents and it is very difficult to disentangle the effects of the concurrent exposures.

Moreover these workers are protected by some other factors associated with their employment at this facility, such as lower alcohol and smoking rates as a consequence of their security clearance requires. This further complicates the interpretation of any harmful effects there might have been suffered."

⁸ *Protocol for the Study of Mortality Patterns Among Uranium Conversion and Enrichment Workers*, NIOSH, J. Stebbins, etal, July 1, 1993, pp.15

93 Defense Authorization Act should go even further, with lifetime annual medical screening. We need fully paid medical insurance for displaced or retired workers. A Medigap supplement should be fully funded by the government for nuclear workers.

- Workers at Portsmouth and Paducah face a unique problem with retiree health care benefits. Since USEC was privatized, it assumed responsibility for the Lockheed Martin retiree health care benefits program. However, these benefits could be in jeopardy if USEC, as many predict, will fall into bankruptcy or liquidate in several years. Unlike pensions, retiree health care benefits are not guaranteed under ERISA. We need legislation to guarantee that the funds which the DOE will be giving to USEC to cover the past retiree health care liability are placed in a safe harbor and these health benefits will be delivered as intended.

SUMMARY

Energy Secretary Richardson acknowledged that “After decades of denial, the government is conceding that workers who helped make nuclear weapons were exposed to radiation and chemicals that produced cancer and early death.”⁹ In the New York Times article, the Secretary said: “In the past, the role of government was to take a hike,....and I think that was wrong.” Nuclear workers have paid a price and deserve a fair remedy.

⁹ *New York Times*, January 29, 2000, pp1.

TESTIMONY OF SAM RAY
BEFORE THE
SUBCOMMITTEE ON IMMIGRATION AND CLAIMS
OF THE
COMMITTEE ON JUDICIARY
U.S. HOUSE OF REPRESENTATIVES

SEPTEMBER 21, 2000

REGARDING
HISTORICAL WORKING CONDITIONS AT THE DEPARTMENT OF ENERGY'S
PORTSMOUTH, OHIO GASEOUS DIFFUSION PLANT
AND
CONGRESSIONAL ACTIONS TO ADDRESS WORKER COMPENSATION FOR
OCCUPATIONAL ILLNESSES FOR DOE NUCLEAR WORKERS

Sam Ray
128 Overlook Drive
Lucasville, OH
740-259-2863

INTRODUCTION

I am Sam Ray, a uranium enrichment worker formerly employed at the Portsmouth Gaseous Diffusion Plant in Piketon, Ohio. I reside at 128 Overlook Drive, Lucasville, OH.

I was hired at Portsmouth in 1954 when the Atomic Energy Commission's uranium enrichment plant first commenced operations. I worked as a production operator and instrument mechanic until May 1994 when I contracted a rare type of bone cancer— chondrosarcoma. As a result, I had to have my larynx removed. My understanding is that there are two things that can cause my type of cancer. One is Paget's Disease, which I didn't have, and the other is radiation, which I did have. I have never smoked a day in my life. It is well documented that certain uranium and transuranic compounds are bone seekers, and I encountered these in my job. I realize, however, that I am more fortunate than many of my former co-workers and friends, who have passed away from different types of cancers, respiratory problems, and other work related illnesses. After my surgery, I was forced to stop work and take a disability retirement.

SUMMARY

DOE investigation reports show that workers have not been adequately protected from radiation exposure in many parts of the Portsmouth plant. This led to the ingestion of enriched uranium, fission products such as technetium-99, and transuranics such plutonium and neptunium. Exposure to heavy metals such as mercury, ingestion of highly corrosive chemicals such as uranium hexafluoride, and inhalation of asbestos and solvents have taken their toll, as well. Even though certain areas had very high levels, workers were not routinely tested for exposure to transuranic elements such as neptunium and plutonium until the 1990s. Radiation exposures were systematically undercounted, due to improper bioassay procedures, in vivo body counting techniques that could not detect transuranics, and failure to conduct extremity monitoring for 30 years. Even in the 1990s, there is confirmed evidence of a worker having his radiation dose records "zeroed out" due to liability concerns, doses being arbitrarily assigned, and neutron doses never being monitored. DOE continues to be exempted from external regulation by agencies such as the Occupational Safety & Health Administration and the Nuclear Regulatory Commission. DOE has functioned as a self-regulating enterprise, and this lack of

accountability facilitated a well documented pattern of placing production ahead of safety.

If and when a worker gets an occupational illness or a cancer that is likely work related, few will bother to file state worker compensation claims because the burdens of proof are nearly insurmountable, and admitting that an illness is occupationally related could jeopardize health insurance coverage. Medical benefit plans uniformly exclude coverage for occupational illnesses and injuries. For those of us who were made ill, or suffered an untimely death, legislation is needed to cover 100% of medical costs, lost income or a lump sum payment. Nuclear workers were placed in harms way to help win the Cold War. A federal remedy is needed for harms created by the federal government. I hope your Committee will see to it that we are not left out in the cold and that legislation will be enacted this year. At a minimum, such legislation should mirror that adopted by the Senate in the Defense Authorization Act (S.2549) and filed in the House as S.5189. This approach will provide a building block for more comprehensive coverage in the future, when other causative agents could be added.

1. PORTSMOUTH FAILED TO PROVIDE WORKERS WITH ADEQUATE MONITORING & PROTECTION FROM RADIATION, HEAVY METALS & TOXIC CHEMICALS

In prosecuting the Nation's cold war mission, workers were kept in the dark about the hazards they faced. Information was provided based on a "need to know" basis—and production imperatives determined what you needed to know. Breach of secrecy, even where safety was at issue, could result in the loss of a security clearance. Even to this day, we don't know what we confronted. For example, when we started feeding irradiated recycled uranium back into the process system, we never knew we were introducing contaminants (e.g., technetium, plutonium, neptunium, etc.), nor were we adequately protected. Over 400 releases of uranium process gases or fluorine have been documented and many more went undocumented.

A. THE PORTSMOUTH OXIDE CONVERSION PLANT (705-E) CAUSED MASSIVE INTERNAL RADIATION DOSES

The Oxide conversion facility, which operated from 1957-1978, converted highly enriched uranium (HEU) oxides into feed material. This was considered one of the most

hazardous operations at Portsmouth. Unacceptably high levels of radiation exposures were documented when the Oak Ridge Operations Office made one of its infrequent inspections to this plant, including high airborne contamination in the work areas, employees allowed to eat in the contaminated cold trap room, lack of respirator protection and increasing radiation lung burdens for chemical operators. A DOE reports notes:

The operating contractor was aware of safety problems in X-705-E; however, production schedules were viewed as more important.¹

Health physics concerns prompted the contractor to install gloveboxes in 1967 to isolate workers from ingesting the fine uranium oxide powders. However, even these glove boxes failed to protect workers adequately, as the gloves deteriorated from exposure to corrosive fluorides. Airborne uranium contamination problems continued caused by the "burn through" of the fluorination tower, leaks from cold traps and product withdrawal and breaches into the system. Two workers were put on permanent work restriction due to ingestion of insoluble forms of uranium and had measured lung burdens over 50% of the allowable limits many years later.

A good friend of mine—Robert Elkins—worked in the X705-E oxide plant from 1962-65. By 1965 he was placed on permanent work restriction due to high internal body counts of radiation. He had enriched uranium, technetium-99, neptunium-237, potassium and cesium in his body. When he retired in 1985 he was still on permanent restriction. In the 15 years since his retirement, the plant management has never contacted him to check on his health or suggest that he be monitored after retirement.

However, the government didn't ignore Mr. Elkins. He was contacted by an individual from Hanford (presumably the transuranium registry) who wanted to pay him \$500 for his cadaver so the government could study what happened to the radiation in his body after he passed

¹ *Independent Investigation of the Portsmouth Gaseous Diffusion Plant, Volume I: Past Environment, Safety and Health Practices*, Department of Energy, Office of Environment Safety and Health, May 2000, pp. 46.

away. He wife was also offered \$500. They both declined the offer. It appears that the government is more interested in what happens to Mr. Elkins after he is dead than what happens to him while he is still alive.

Mr. Elkins' over exposures to radiation were not the exception, they were the rule. A 1985 DOE report states²:

The oxide conversion facility was not able to maintain adequate containment of the radioactive materials during operating periods.

As such, the decision was made in the 1977 time frame to shut down that facility pending modifications to provide adequate containment measures. These modifications were never funded, and the facility has not operated since.

In vivo body counts (an insensitive method of measuring the amounts of radiation in the lung) taken after 1965 found eight employees with radiation counts above DOE's 15 rem lung standard and two other employees had more than 7.5 rem (50% of the maximum permissible body burden). Since 1972, another 7 were found with more than 7.5 rem.³ Of the 17 employees listed above, 11 had worked in the oxide conversion facility, underscoring the point that workers in the oxide conversion facility were subjected to intolerable, if not barbaric, working conditions.

B. NEUTRON DOSES WERE NOT MEASURED BETWEEN 1954 AND 1992

The Portsmouth plant's radiation dosimetry programs were woefully inadequate. NIOSH discovered that between 1954 and 1992 the site never measured for neutron exposures. Worker dose records, consequently, do not exist for neutrons. "Slow cooker" effects from the concentration of uranium deposits in the cascade, as well as in uranium storage and feed

²*The Report of the Joint Task Force on Uranium Recycle Materials Processing*, Department of Energy, 1985, DOE/OR-859

³*Information on Three Ohio Defense Facilities*, Fact Sheet for the Ranking Minority Members, Subcommittee on Energy, Nuclear Proliferation and Government Processes, Committee on Governmental Affairs, U.S. Senate, November 1985, GAO/RCED-86-51 FS.

operations results in chronic low level neutron exposures. Workers who were called in to clean-out "freeze ups" of uranium inside of the cascade would be particularly at risk. When high dose readings were found on badges, they were routinely determined to be equipment failures and summarily discarded.

C. WORKERS WERE EXPOSED TO TECHNETIUM-99 WITHOUT MONITORING

Technetium-99 (Tc-99), a fission product, was introduced into the cascades beginning in 1955 from recycled uranium reactor tails, most which had been first processed at Paducah. DOE has found that workers were not monitored until 1975, resulting a 20 years of missing exposure data. Once monitoring began it is clear that significant uptakes went unmeasured. Worker urine dose records from CY 1976, 1977 and 1978 indicate that 27% of the chemical operators at Portsmouth tested positive for Tc-99 (66% tested positive for uranium)⁴. *In vivo* lung monitoring established that 2 of the 45 maintenance mechanics had positive confirmed doses of Tc-99 to the lungs. Curiously, 563 mechanics were tested for uranium over a three year period, but only 45 were tested for Tc-99 or neptunium-237—a far lower exposure rate than for operators. Depending on whether the Tc-99 was in a vapor or solid form, special personal protective equipment (such as supplied air respirators) was required, but not provided until the early 1980s. One pregnant worker had a calculated dose 800 millirem to the fetal thyroid⁵ of her 10-11 week old fetus, providing further evidence of inadequate worker protection. In 1979, a Tc-99 release in the convertor maintenance area caused the internal contamination of six workers as high as five times the plant restriction levels.

D. EXPOSURES TO NEPTUNIUM AND PLUTONIUM WERE NOT MONITORED OR DISCLOSED UNTIL THE 1990S

At the production level, we were never told about or tested for exposure to plutonium,

⁴ Response to Freedom of Information Act Request by OCAW to the DOE, July 1, 1982.

⁵ A July 22, 1976 letter from Karl Hubner, Oak Ridge Associated Universities to E.V. Hansen, Goodyear Atomic, states: "The dose of 0.8 to 1.0 rad to the thyroid gland of a fetus is considered to be insignificant, and there is no reasonable chance of damage to this organ in terms of cretinism." The letter qualified this conclusion by stating: "calculations were based on some gross assumptions that had to be made because of insufficient data."

neptunium or other transuranics until the 1990s, even though recycled reactor were fed into the Portsmouth cascade beginning in 1955, and the AEC knew that the reactor "tails" at Paducah contained neptunium in 1957. Today, it might seem incomprehensible that workers were not tested for potent carcinogens such as plutonium until 40 years after plant operations commenced. DOE's reports reveal that "transuranics were a special problem in 1965, 1966, 1975 and 1976 when recycled foreign reactor feed in the form of uranyl nitrate was converted to oxide in the calciner." A 1979 analysis of two cascade deposits revealed relative high concentration of neptunium-237 (55 and 60 percent of total alpha activity), however, there was no change in procedure to protect workers. Management was basing its radiation protection program on worker exposure to uranium even though the specific radioactivity of neptunium is 2000 times higher than depleted uranium.⁶

E. DOSE RECORDS HAVE BEEN 'ZEROED' OUT OVER LIABILITY CONCERNS

A Senate Government Affairs hearing held in March 2000 confirmed that management directed that a guard's radiation dose records be "zeroed" out after he had an uptake and was hospitalized, because of the concern that he would bring a worker comp claim. We have no idea if this was an isolated case or a regular management practice on the part of Lockheed; however a DOE report stated, "an internal Lockheed martin Utility Services investigation concluded improprieties may have existed in the Plant's dosimetry program that resulted in the assignment of inaccurate exposures."⁷

F. RADIATION DOSES WERE ARBITRARILY "ASSIGNED" (INSTEAD OF BEING COUNTED), AND SIGNIFICANT RADIATION DOSES WERE NEVER COUNTED

In the late 1990s, OSHA was called into Portsmouth after complaints filed by OCAW and the Guards union disputed the accuracy of radiation doses. OSHA has jurisdiction over USEC,

⁶ *Independent Investigation of the Portsmouth Gaseous Diffusion Plant, Volume 1: Past Environment, Safety and Health Practices*, Department of Energy, Office of Environment Safety and Health, May 2000, pp.19, 35.

⁷ *ibid*, pp. 37.

the government corporation that took over enrichment operations in 1993. Doses were administratively "assigned" when the health physics staff had trouble reading individual dose badges. One practice involved pinning a dose badge to the wall and running a scanner over it and assigning this dose to any person whose individual dose badge didn't read out on a scanner. A settlement of this OSHA complaint resulted in a reconstruction of doses between 1993-1995. While management was generally conservative in assigning doses, at least 103 doses were undercounted. We have no idea how far back management was simply administratively "assigning" doses, instead of counting them.

Goodyear Atomic failed to perform any extremity monitoring for radiation exposure until the 1980s, even though operators handled valves with beta emissions as high as 1 rad/hour and feed production plant ash receiver areas had floor readings of 5/rad per hour beta⁸. DOE's investigators found that we were not tested in a timely fashion for uptakes of uranium during the 1950's and 1960's and concluded that "some uranium uptakes were likely not identified or properly investigated." Air sampling methods for radioactivity were also found deficient by DOE.

G. WORKERS WERE OVEREXPOSED TO MERCURY, ARSENIC, FLUORINE AND TRICHLOROETHYLENE

Between 1981 and 1990, decontamination workers in the 705 building were exposed to mercury at up to 175 times the OSHA threshold limit values, largely from open vats of solvents. A 1990 DOE investigation found "workers were exposed at least once per shift, after sodium hydroxide was added tanks" and that Martin Marietta's plant doctor trivialized the hazards of ingesting mercury.⁹

⁸ *Independent Investigation of the Portsmouth Gaseous Diffusion Plant, Volume 1: Past Environment, Safety and Health Practices*, Department of Energy, Office of Environment Safety and Health, May 2000, pp. 36.

⁹ Letter from Gene Gillespie, Site Manager, DOE to Ralph Donnelly, Plant Manager, Martin Marietta, July 20, 1990, Letter EO-221-696.

Arsenic contaminated feed was fed into the Portsmouth cascades in the late 1980's. Arsenic, which is a known carcinogen, migrated towards copper instrument lines causing them to plug up. Air samples detected arsenic in excess of OSHA limits. In 1993 inorganic arsenic was discovered, and the union subsequently requested a health hazard evaluation over concern that there were inadequate controls.

Fluorine gases from the fluorine plant stack were frequent and resulted in numerous complaints from workers in the area, especially during temperature inversions, fog, rain or when the vented gases are forced to ground level.¹⁰

Trichloroethylene (TCE) was used as a degreaser and chiller. A 1986 special survey found levels of TCE in excess of the OSHA permissible levels in process building X-326.

H. RESPIRATORY PROTECTION DEPENDED ON WWII-ERA GAS MASKS FOR MANY YEARS, AND WORK AREAS WERE NOT PROPERLY TESTED FOR PRESENCE OF RADIONUCLIDES

I worked at the Extended Range Product (ERP) station on and off for a number of years. On one occasion while connecting the production process into an empty cylinder, the copper tubing pigtail ruptured. Although I immediately valved off the system, the room was filled with a thick fog of uranium oxide gases. I donned an army assault mask for protection. After the all clear signal, management sent me to the hospital for urinalysis. Today, we know that you should wait for 3-4 hours to give the material time to get into your system before urinalysis. For that reason, my dose records from this accident is going to be suspect, at best.

Indeed, until the mid 1970's, our respirator protection consisted of World War II army assault masks. It was years later that we learned that these were not adequate to block

¹⁰ *Independent Investigation of the Portsmouth Gaseous Diffusion Plant, Volume I: Past Environment, Safety and Health Practices*, Department of Energy, Office of Environment Safety and Health, May 2000, pp.27.

radionuclides or toxic chemicals.

In the late 50's and early 60's, we had big layoffs. As a result, the preventative maintenance program went down hill, causing the equipment to not be properly maintained. Prior to this layoff, the lab handled all sampling equipment, and assured that there was <10 ppm uranium hexafluoride in the system--called a "negative"--prior to it being opened up for maintenance work.

Due to cutbacks, operators had to take over this work of the lab technicians, however, we were required to use a new system for testing that consisted of pulling a sample through a tube of salicylic acid (white powder). If the powder didn't change color in three (3) minutes, then it was assumed the system was safe to enter (<10 ppm UF6). We now know this was never an approved method, and there was no research done on this approach. Consequently, we put maintenance workers in harm's way when we issued a hazardous work permit stating that system was safe to enter.

I. WORKERS WERE KEPT IN THE DARK ON CONTAMINATION CONTROLS

Early on, we were told that the buildings would be so clean, we could eat off the floors. In reality, some eating areas became so contaminated that management had to build designated lunch rooms that were surveyed on a regular basis and kept clear.

Due poor contamination control, certain buildings were becoming more contaminated. For example, leaks from the ERP station had spread contamination in the X-326 building. Compressors would malfunction and process gases (UF6) would leak to the atmosphere¹¹. On one occasion, it was so bad that it looked like a fog moving up the ½ mile long building. When I

¹¹ Process gases were routinely vented to the atmosphere to obtain "negatives" to prepare the cascade cells for maintenance. Records show 23,000 lbs of uranium and 27 curies of technetium-99 were released to the atmosphere, and many more releases went unrecorded because vent emissions were not continuously recorded until the mid 1980s.

working as an instrument mechanic, I had to work in areas that I knew or suspected were contaminated. I often felt we should have radiation surveys to see if the area was contaminated, but at the time it was a hassle to get your supervisor to request a survey.

We have had many small releases which were never reported, as well as documented large releases. Inside of the withdrawal room we had a major release. There were green "icicles" hanging in the room from crystalized uranium Hexafluoride. Management had declined to install safety measures to prevent this release.

Goodyear Atomic issued a *Health Physics Philosophy as a Guide for Housekeeping Problems in the Process Areas*, which it distributed to all supervisors on August 27, 1962. While management assured workers there was no hazard at the uranium enrichment facility in Portsmouth, Ohio, it warned supervisors:

We don't expect or desire that the philosophy will be openly discussed with bargaining unit employees. Calculations of contamination indices should be handled by the General Foreman and kept as supervisory information in deciding the need for decontamination.

Until the 1980's, there were few or no personal radiation monitors (frisking devices). This technology was available, but apparently for DOE the cost outweighed the risk. In the 90's, this all changed. In certain buildings and certain areas, you have to monitor clothing and shoes. Without a doubt, if we tried to operate today, as we did the first 25 to 30 years, NRC would cite the plant for violations.

When I was hired in 1954, process operators were not allowed to wear coveralls or safety shoes. If clothing became contaminated, we took this contamination home with us on our clothing and shoes. To my knowledge, crafts (such as electricians, maintenance mechanics, etc) were allowed to wear coveralls and safety shoes. Sometime in the 60's, coveralls became optional for process operators like myself; however, it wasn't until the 90's when contamination

controls were implemented that coveralls became mandatory. In reality, they should have always been mandatory.

Current workers benefit greatly by the present safeguards in place. Primarily, the problem lies in the first 35 years. What were the former workers exposed to unknowingly or may be knowingly? We know that they are having many health problems, such as cancers, respiratory problems, etc. and in numbers far greater than would be expected.

2. INSPECTIONS WERE INFREQUENT UNDER DOE'S POLICY OF SELF REGULATION

A July 1980 Comptroller General report, *Department of Energy's Safety and Health Program for Enrichment Plant Workers Is Not Adequately Implemented* (EMD-80-78), found that DOE's Oak Ridge Office, which had oversight responsibility for health and safety, had not conducted a safety inspection at Portsmouth for 3 years and was not adequately responding to worker safety complaints. Unannounced safety inspections were supposed to occur annually at each plant, but even when they were inspected, the Oak Ridge Office "does not, as part of an inspection or any other visit to an enrichment plant, monitor for radiological contamination." Oak Ridge explained the absence of inspections on a staff shortage, which the Comptroller General noted was attributable to Oak Ridge paying safety inspectors at a lower grade than elsewhere in the DOE complex.

3. HEALTH EFFECTS ARE ON THE MINDS OF MANY CURRENT AND FORMER WORKERS

Currently, I am a retiree representative for the Worker Health Protection Program. Funded by DOE, this program gives former workers a one-time complete physical, and lung cancer screening will be added this fall. When I talk to former workers and retirees, I find out how little they knew about what they were exposed to. I get calls from widows whose husbands have passed away with cancers. They want to know if their spouse's exposure in the workplace caused their illness.

In 1987 NIOSH reported that Portsmouth workers had experienced excess stomach

cancer and hematopoietic cancers (including leukemia). In 1992, the study was updated, in part due to a request from Senator John Glenn. In 1996, the study summary was presented to the workforce. It indicated that there were no statistically significant elevations of any cancer deaths and the elevations of stomach and hematopoietic cancers identified in the 1987 study had diminished. These results were presented to the media in September 1999¹². However, the NIOSH officials releasing this information apparently chose to delete the page explaining the study's limitations¹³. We obtained the deleted text from another source. One of the key uncertainties is the fact that the population is still relatively young and that the poor quality of

¹² *Portsmouth Gaseous Diffusion Plant: Study Summary*, Rinsky, Ahrenholz, and Cardarelli, September 1999

¹³ Restated below are portions that were mysteriously deleted by NIOSH before releasing the summary:

"All observational epidemiologic studies have some limitations since they take advantage of naturally occurring events rather than being conducted in an experimentally controlled environment. Here are the biggest limitations that we know about:

1) This is still a very young population and the vast majority of them are still alive. As the workforce grows older, deaths will occur at an increasing rate and of course there is no way to know what these people will eventually die from;

2) this is a study of mortality, not disease incidence. Only diseases that have high case fatality rate are measured well by mortality. Although most cancers have a high case fatality rate, there has been great progress over the past two decades in prolonging the life of persons with hematopoietic cancers. Mortality may not be a good measure of these deaths;

3) SMR analyses are not particularly good attributing the proper effects of confounding and effect modification. The case control studies that are being worked on are much better in this regard;

4) the exposure response portion of these analyses are only as good as the exposure metrics. Because of the way the plant collected exposure data our algorithms for assigning exposure, while the best that can be done, still have a degree of uncertainty. To the extent that real exposures are over or under estimated, our answers will be in error, and finally,

5) these workers were simultaneously exposed to a number of chemical and physical agents and it is very difficult to disentangle the effects of the concurrent exposures.

Moreover these workers are protected by some other factors associated with their employment at this facility, such as lower alcohol and smoking rates as a consequence of their security clearance requires. This further complicates the interpretation of any harmful effects there might have been suffered."

exposure data makes it difficult to establish cause and effect relationships. What motivated this apparent censorship is beyond our knowledge. What is clear is that the study is far from conclusive.

4. RECOMMENDED ACTIONS FOR CONGRESS

- Representative Ed Whitfield and 23 members co-sponsored HR 4398, a comprehensive bill that provides a federal worker compensation remedy for those exposed to radiation, beryllium, silica, toxic chemicals and heavy metals at DOE nuclear facilities and suppliers. It stands out amongst other bills seeking compensation for radiation exposed workers because, unlike the Administration's bill (HR 3418), it expands coverage beyond the Paducah workforce and 55 workers in Oak Ridge to cover the entire DOE nuclear complex. Compensation is modeled after the Federal Employee Compensation Act (FECA).
- HR 5189, which was introduced by Representative Mark Udall, covers radiation, beryllium and silicosis through a program administered by the Department of Labor. It is funded as "direct spending" and replicates Title 35 to the FY 2001 Defense Authorization Act (S.2549) that was adopted by the Senate is before the House-Senate Conference Committee. While Title 35 is not as comprehensive as HR 4398, Title 35 is a very, very important building block that addresses some of the most glaring problems confronted by nuclear workers seeking worker compensation. Allow me to be clear: this provision should be included in the House-Senate Conference Report to the defense bill. Waiting another year to take action--as some have suggested-- is not fair to those who are suffering today and who have waited far too long already.
- Any successful bill must shift the burden of proof to the government in determining causation where the exposure data is missing or of poor quality, because the failure to properly monitor for radiation and toxic hazards unfairly imposes an insurmountable burden of proof on a victim. HR 5189 and Title 35 create a special category of workers at Portsmouth, Paducah and Oak Ridge K-25 sites where the dose data cannot be reconstructed to establish proof. Some types of dose estimation to compensate for missing data can be useful, but the threshold for establishing "proof" must take account of the wide errors inherent in even the best dose estimates. Good science relies upon good data. As NIOSH noted in a 1993 report, that "prior to 1981, the amount of quantitative industrial hygiene data is scant to non existent."¹⁴
- A single agency, such as the Labor Department's Office of Worker Compensation Programs, should administer a federal workers comp program. An ideal program provides one-stop shopping for addressing occupational illnesses regardless of whether it

¹⁴ *Protocol for the Study of Mortality Patterns Among Uranium Conversion and Enrichment Workers*, NIOSH, J. Stebbins, etal, July 1, 1993, pp.15

is beryllium, radiation, toxic chemicals or heavy metals. Shifting claims for toxic exposures to the states is ill-advised. HR 5189 and the Title 35 provide for a report to Congress by the GAO to evaluate whether state programs can be made to work in cooperation with an Office of Worker Advocacy with DOE. Again, we would prefer a comprehensive bill to be passed this year, but the approach provided in the Senate lays a foundation upon which Congress can build in the future.

- The current medical screening program carried out by DOE under Section 3162 of the FY 93 Defense Authorization Act should go even further, with lifetime annual medical screening, and fully paid medical insurance for displaced or retired workers. A Medigap supplement should be fully funded by the government for nuclear workers.
- Workers at Portsmouth and Paducah face a unique problem with retiree health care benefits. Since USEC was privatized, it has assumed responsibility for the Lockheed Martin retiree health care benefits program. However, these benefits could be in jeopardy if USEC, as many predict, will fall into bankruptcy in several years or is liquidated even sooner. Unlike pensions, retiree health care benefits are not guaranteed under ERISA. We need legislation to guarantee that the funds which the DOE has already transferred to USEC to cover the retiree health care liability are placed in a safe harbor and these benefits will be delivered as intended.

SUMMARY

On January 29th of this year, the New York Times reported: *"After decades of denial, the government is conceding that workers who helped make nuclear weapons ... were exposed to radiation and chemicals that produced cancer and early death."* In the article, Energy Secretary Bill Richardson said, *"In the past, the role of government was to take a hike,....and I think that was wrong."* Nuclear workers have paid a price and deserve a fair remedy. The Senate has passed a provision that would spend a portion of the budget surplus to help those made ill in the service to our national security. We urge your Committee to help make that provision become law this year.

PORTSMOUTH GASEOUS DIFFUSION PLANT (PORTS)
RADIOLOGICAL/CONTAMINATION PROFILE
(Compiled and Edited by: Jeanne Cisco, Paul Mullens and Sam Ray)

INDEPENDENT INVESTIGATION OF THE PORTSMOUTH GASEOUS DIFFUSION PLANT, VOLUME 1 - May 2000

“The environmental monitoring program at PORTS was initiated in 1955.

“During the 1952-1953 period, the AEC approved the enrichment processing of production reactor tails through gaseous diffusion process. In 1957, radiological surveys at the Paducah Plant identified that neptunium-237 was present in the enrichment cascade. Although the AEC recognized the potential for transuranic contamination of the cascades, it was not until a 1965 appraisal that OR identified a potential problem with transuranics and fission products in X-705E and recommended studies to determine where these materials could concentrate in the process. Records reflect that PORTS then reviewed the potential problems posed by feeding reactor returns to the oxide conversion plant; however, detailed studies were not performed. PORTS correspondence also indicates that health physics staff did not fully understand the presence of transuranics and technetium-99, and appropriate analytical procedures were not developed as late as 1976. During the 1970s, PORTS health physics and Plant managers participated in pre-planning for receipt and subsequent processing of recycled uranium known to contain trace quantities of neptunium-237, plutonium-239/240, and technetium-99. Planning activities included development of recommendations for material receipt specifications and specific controls to minimize personnel exposures, including the use of containment devices and ventilation systems. Many recommendations were implemented but were not sufficient.”

“PORTS was also aware of the presence of technetium on process equipment as early as 1962, but also assumed that transuranics and fission products would not be a significant hazard to workers. No special monitoring or personnel protection controls were established.”

Health and safety activity reports from the mid-1960s identified that excessive inhalation of uranium compounds was the major radiation and contamination risk at PORTS. PORTS documents also reveal that internal deposition became a problem in 1965 from handling insoluble enriched uranium, and that urine sample results were neither reliable nor as sensitive as analysis for soluble forms.

During the 1960s, the Ports health physics group became concerned with increasing alpha radiation levels in process and support facilities at the site. While no records were identified to demonstrate that this issue was satisfactorily resolved, the period coincides with the processing of recycled uranium at the Paducah Plant. In 1979, isotopic analysis of two cascade deposits revealed relative high concentration of neptunium-237 (i.e., 55 percent and 60 percent of the total alpha activity in the samples was due to Np-237, respectively). However, there was no indication of a change in the radiological control program to address this issue, even though data was available to indicate that some level of transuranic contamination was present in the cascade. Transuranic sampling for work planning and control was not actively conducted until the 1990s.

The low specific activity and the self-shielding properties of uranium handled at the site limited dose rates at PORTS. However, certain operations were known to result in higher exposure potential. Routine whole body beta exposures in excess of PORTS investigation levels existed

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During the 1960s, the Ports health physics group became concerned with increasing alpha radiation levels in process and support facilities at the site. While no records were identified to demonstrate that this issue was satisfactorily resolved, the period coincides with the processing of recycled uranium at the Paducah Plant. In 1979, isotopic analysis of two cascade deposits revealed relative high concentration of neptunium-237 (i.e., 55 percent and 60 percent of the total alpha activity in the samples was due to Np-237, respectively). However, there was no indication of a change in the radiological control program to address this issue, even though data was available to indicate that some level of transuranic contamination was present in the cascade. Transuranic sampling for work planning and control was not actively conducted until the 1990s.

The low specific activity and the self-shielding properties of uranium handled at the site limited dose rates at PORTS. However, certain operations were known to result in higher exposure potential. Routine whole body beta exposures in excess of PORTS investigation levels existed

primarily in areas where uranium daughter products tended to concentrate. Documents revealed and interviews conducted with former production workers and Industrial Hygiene and Health Physics Department staff members indicated that these areas included ash receivers, sintered metal filter baths, converter disassembly work, cylinder washing, oxide conversion, and the technetium and uranium recovery processes. Exposure evaluations during the mid to late 1950s indicated numerous instances of workers being placed on work restriction based on whole body exposures that were determined to be in excess of PALs. Documents also indicated that before the mid-1980s, Goodyear Atomic Corporation had never performed extremity monitoring for any operation or work activity. Documents indicated that various VALVES ASSOCIATED WITH PIGTAIL OPERATIONS HAD RECORDED BETA READINGS AS HIGH AS 1 RAD/HOUR. Feed production plant ash receiver areas had floor readings of 5 rad/hour beta. Operators routinely handled these valves and equipment in X-705 and other locations where significant hand exposures could occur.

“Dosimetry Programs at PORTS from 1954 to 1992 were neither calibrated nor monitored for neutron exposures. A National Institute of Occupational Safety and Health (NIOSH) evaluation for PORTS studied the neutron radiation issue in 1997 and concluded that there was potential for chronic low-level neutron exposures in areas where uranium was stored (cylinder yards), handled (feed and withdrawal areas), or solidified within the cascade (deposits).”

“In 1998, OSHA cited USEC for failing to preserve and maintain records of employee exposure of all employees for at least 30 years. OSHA found that “records of radiation exposures for all company employees were not adequately maintained from 1993 to 1995 in that some employees’ exposures were arbitrarily assigned and based solely upon their past exposures which may differed from exposures experienced during the period relating to the assigned dose.” Furthermore, “records of radiation exposures were not accurately preserved and maintained. For the period 1993 to 1995, some TLDs that were used to measure and create a record of employee radiation doses were not evaluated, and a zero dose was assigned to an employee where the exposed TLD which was assigned to the employee was damaged.” In response to the outstanding OSHA dosimetry citation, USEC initiated a dosimetry reconstruction effort.”

“Administrative corrections to the site’s dosimetry program to prevent reoccurrence of these issues were implemented, however the documents indicate that “the DOELAP (Laboratory Accreditation Program) TLD database, although reliable, still had overall validity concerns.” (Inconsistent and incomplete external exposure monitoring and data management practices have impacted PORTS’ ability to demonstrate that all exposures to personnel have been measured and recorded accurately.)”

“During the 1950s and 1960s, urine samples were typically analyzed for uranium, and in most cases for alpha activity. Typically, the sample collection procedure involved the collection of Monday morning urine specimens (the morning following two or more days off the job). This was non-conservative, and the collection date evolved to a “Friday” sample during the 1970s and 1980s. Considering that numerous routine urinalysis results reflected uranium intakes in the years of operation and the rate at which soluble uranium is excreted, some uranium intakes were likely not identified or properly investigated. Technetium analysis was added in the 1970s.”

“Transuranics were a special problem in 1965, 1966, 1975, and 1976, when recycled foreign reactor feed in the form of UNH was converted to oxide in the Calcliner.”

“Routine, accidental, diffuse, fugitive, and planned emissions of radioactive materials and fluorine to the environment have occurred at PORTS since the beginning of operation in 1954.” “Vent emissions at PORTS were not monitored continuously until the mid-1980s. “The unreliability of space recorders and the inaccuracy of grab sampling when compared to continuous monitoring indicate that emissions may be have underestimated.””

“Industrial Hygiene and health Physics summary reports for the late 1950s to late 1960s indicated that it was common to have stationary and portable air samples in excess of limits. These above-limit samples typically were related to process upsets, equipment failure, or maintenance activities, and were valid high readings. Although logbooks indicated many dusty operations or smoky conditions in all buildings, most of these samples were related to operations in X-326 and X-705.”

“In 1957, radiological surveys at the Paducah Plant identified that neptunium,-237 was present in the enrichment cascade. Although the AEC recognized the potential for transuranic contamination of the cascades, it was not until a 1965 appraisal that OR identified a potential problem with transuranics and fission products in X-705E and recommended studies to determine where these materials could concentrate in the process. Records reflect that PORTS then reviewed the potential problems posed by feeding reactor returns to the oxide conversion plant; however, detailed studies were not performed.”

“Many operations and maintenance activities at PORTS involved hazardous conditions and the potential for exposure of personnel to physical, radioactive, and chemical hazards.” “Leaks and off-gassing from process equipment or components being repaired or replaced exposed workers to airborne uranium, transuranics, fission products, fluorine, and hydrogen fluoride (HF) gas. Others worked with, or were exposed to, various hazardous materials and chemicals such as asbestos, trichloroethene (TCE) and other solvents, polychlorinated biphenyls (PCBs), acids, chromium, nickel, lithium, welding fumes and gases, and mercury. Radioactive or hazardous materials were spilled or released to the environment from production related facilities and attendant work activities.”

“Over its entire period of operation (1957 to 1978), the oxide conversion process was probably one of the most hazardous radiological and chemical operations at PORTS.”

“Probably the most hazardous operations at PORTS involved the operation of the oxide conversion plant, which had continuous airborne and surface radioactive contamination problems over its 21-year lifetime, from 1957 to 1978. Personnel working in this facility were exposed to transuranics from recycled reactor fuel feed and to insoluble airborne uranium oxides. Several workers, later put on permanent restriction from working in airborne-contamination areas, received significant intakes that were still detectable in their lungs decades later. Maintenance and modification activities that required breaching process systems or components also exposed workers to radioactive uranium hexafluoride (UF₆) process gas and HF. Decontamination activities in X-705 (Decontamination and Cleaning Building) and elsewhere involved exposures to hazardous solvents and generated the largest amount of radioactive and hazardous liquid waste on site.”

“Early safety engineers were transitioned staff from Human Resources Department, with no formal safety background, training, or preparation for becoming safety engineers. During this period, there

were eight safety engineers. In 1958, AEC published a set of “Minimum Safety Requirements” that established safety goals, which could not always be achieved.”

“Hundreds of UF6 releases occurred from equipment failures and during maintenance, sampling, cylinder handling, and connection and disconnection of feed and product cylinders. These releases caused many intakes of uranium and HF burns, and they contaminated work areas and the environment.”

“During the 1960s, the PORTS health physics group became concerned with increasing alpha radiation levels in process and support facilities at the site. While no records were identified to demonstrate that this issue was satisfactorily resolved, the period coincides with the processing of recycled uranium at the Paducah Plant.”

-from pages 2, 4, 18, 27, 31, 35, 36, 37 38, 39, 45

August 27, 1962 Interdepartmental Correspondence GAT-810-62-54

Subject: **HEALTH PHYSICS PHILOSOPHY AS A GUIDE FOR HOUSEKEEPING PROBLEMS IN PROCESS AREAS**

“Ben Kalmon has refined the Health Physics philosophy on contamination problems involving housekeeping in the process areas and has prepared a procedure for determining the contamination index for the X-326 cell housings. His group is still working on procedures for the determination of contamination indices for the floor, top of compressor housings and inter-cell housings. These procedures will be forthcoming. In the meantime, it would appear that the general philosophy presented can be adapted to the conditions in the area using our good judgment to see that its provisions are maintained.

The general philosophy should be passed down to the foremen for their use as a guide in handling housekeeping problems involving contamination considerations. We don't expect or desire that the philosophy will be openly discussed with bargaining unit employees. Calculations of contamination indices should be handled by the General Foremen and kept as supervisory information to help in deciding the need for decontamination.”

INDEPENDENT INVESTIGATION OF THE PORTSMOUTH GASEOUS DIFFUSION PLANT, VOLUME 1 - May 2000

“Inconsistent and incomplete external exposure monitoring and data management practices have impacted PORTS' ability to demonstrate that all exposures to personnel have been measured and recorded accurately.”

“Although the AEC recognized the potential for transuranic contamination of the cascades, it was not until 1965 appraisal that Oak Ridge identified a potential problem with transuranics and fission products in the X-705E, and recommended studies to determine where they could concentrate in the process. Although records indicate that PORTS reviewed the potential problems posed by feeding reactor returns to the oxide conversion plant, detailed studies were not performed. Goodyear Atomic Corporation concluded that transuranics were not a significant radiological concern when

compared to uranium, and tower ash (where transuranics were expected to concentrate) could be monitored to measure the existing hazard. However, this monitoring program was not implemented. PORTS was also aware of the presence of technetium on process equipment as early as 1962, but also assumed that transuranics and fission products would not be a significant hazard to workers. No special monitoring or personnel protection controls were established. This posture persisted until 1975, when sampling and analysis of media, including pond sludge and waste samples, identified technetium-99.”

“In 1957, radiological surveys at the Paducah Plant found neptunium-237 in the enrichment cascade. Although the AEC recognized the potential for transuranic contamination of the cascades, it was not until a 1965 appraisal that OR identified a potential problem with transuranics and fission products in X0705E, and recommended studies to determine where they could concentrate in the process. Although records indicate that PORTS reviewed the potential problems posed by feeding reactor returns to the oxide conversion plant, detailed studies were not performed.”

“In-vivo monitoring was performed on oxide conversion plant workers, and, in 1965, significant intakes of insoluble uranium were detected in at least two of these workers. These employees were put on permanent restriction and had measured lung burdens over 50 percent of allowable limits many years later. One worker still had a significant lung burden when he retired in 1985.”

“In 1965, an in-vivo body counting program was initiated to monitor for insoluble enriched uranium, a material for which the urinalysis program was not sufficiently sensitive or reliable. Studies performed in 1990 indicated that the in-vivo counter’s capability for analyzing transuranics was questionable, making it difficult to demonstrate that all internal exposures have been accurately detected and assessed.”

“In-vivo radiation monitoring for insoluble radionuclides by lung counting was initiated, first by sending workers to Fernald or Oak Ridge, and later using a mobile counter periodically sent to PORTS from Oak Ridge. However, lung-counting methods were not sufficiently sensitive and were only effective for assessing relatively large intakes.”

“Some workers had extremely high intakes of uranium detected by bioassay or in-vivo testing that put them on work restriction for months or years. In 1965, ten employees sustained lung exposures greater than one-half the permissible level, and eight were reported to the AEC as overexposures in accordance with AEC regulations. In addition, a worker who had a massive intake of UH6 in 1973 was still excreting uranium six months later, and two workers in 1965 were exposed to uranium levels high enough that, as late as 1973, in-vivo testing showed greater than 50 percent of the maximum allowable body burden for uranium. Finally, one worker, still living, was put on permanent restriction in 1981, and his in-vivo monitoring before his 1985 retirement still showed high uranium readings in his lungs.”

“X-705 OXIDE CONVERSION

“A handwritten report entitled “oxide conversion as viewed by Development” was written by a member of the Development Department (CIRCA 1966) in response to a significant error in the uranium mass balance in X-705E. The report explained that the oxide conversion process was originally established as a waste recovery process. The subsequent introduction of reactor returns converted X-705E into a production facility, requiring a capacity that “it was ill-equipped to

handle.” The report further explains that Uranium Inventory Control and Health Physics concerns were secondary to production schedules and costs. This report provides evidence that the operating contractor was aware of safety problems in X-705E, however, production schedules were viewed as more important.”

“Worker safety and health programs were established when the Plant started operation and have evolved significantly. The implementation and effectiveness of these programs varied widely and, in many ways, failed to adequately protect the safety and health of PORTS workers. It was not until the 1990’s that a more focused and rigorous ES&H training program was established.”

“The exposure of workers to radioactive materials was monitored, and with some exceptions, documented exposures were within the limits applicable at the time. However, monitoring deficiencies caused exposures to airborne radioactivity to be underestimated, and actual exposures were likely higher than indicated by PORTS monitoring records. Extremity monitoring was not employed; exposures of hands, feet, eyes in high beta radiation fields were underestimated and could have resulted in exposures exceeding limits.”

“Industrial safety, industrial hygiene, and health physics staff performed surveys, inspections, and event analysis and made recommendations for hazard controls and personnel protective actions. However, they had little oversight or enforcement authority until the 1970s. Staffing for all safety and health organizations was very limited well into the 1970s and was insufficient to provide adequate attention for up to 2500 employees working in numerous and varied hazardous conditions.”

“Radioactive contamination and control limits were established to minimize personnel exposures and prevent exceeding regulatory limits. A network of stationary air samplers and portable and breathing zone samplers provided data on airborne contamination. This monitoring frequently showed that limits had been exceeded. PORTS’ assumption that all uranium intakes were soluble compounds that would be excreted quickly and could be monitored effectively by urinalysis was not conservative for some locations and activities where insoluble aerosols were generated, such as the oxide conversion plant and from maintenance activities involving grinding, cutting and buffing.”

“Monitoring deficiencies cause exposures to airborne radioactivity to be underestimated, and actual exposures were likely higher than indicated by PORTS monitoring records. Extremity monitoring was not employed; exposures of hands, feet, and eyes in high beta radiation fields were underestimated and could have resulted in exposures exceeding limits.”

“Due to weaknesses in monitoring programs, such as the lack of extremity monitoring, exposure limits may have unknowingly been exceeded. In addition, communication of hazards, the rationale for and use of protective measures, accurate information about radiation exposure, and the enforcement of protective equipment use were inadequate. Further, workers were exposed to various chemical hazards for which adverse health effects had not yet been identified. Management also failed to ensure that hazard controls were implemented by supervisors and workers, resulting in additional and higher exposures to personnel and continuing unnecessary radioactive contamination.”

“PORTS had a fairly conservative contamination control policy; however, historical evidence suggests that management expectations for contamination control were often not met in the field.”

“The shortage of respirators is confirmed by the union safety meeting minutes in the 1973 to 1975 period.”

“Records of radiation and contamination surveys were readily available from the start of Plant operation. Survey records for all major buildings indicate contamination levels above limits over many years. Recommendations for decontamination of locations exceeding PALs were typically made and noted by Industrial Hygiene and Health Physics personnel on the survey forms. In some cases, follow-up surveys noted that areas continued to be contaminated above limits, with continued recommendations for decontamination. However, rigorous enforcement of decontamination requirements was not evident.”

-from pages 3, 4, 6, 17, 19, 21, 24, 39, 40, 46

REPORT BY THE COMPTROLLER GENERAL OF THE UNITED STATES, July 11,1980

“Radioactive release (Portsmouth; May 2, 1973; type A)

“A uranium hexafluoride release occurred as an employee was attempting to take a liquid sample of material from a storage cylinder. The leak, which lasted approximately 20 minutes, resulted in the loss of 215 pounds of uranium. Damage was estimated at about \$13,600; no injuries or exposures resulted.”

“Compressor failure resulting in radioactive release (Portsmouth; April 10, 1975; type B)
Failure of an expansion joint resulted in the release of nearly 27 pounds of uranium over a 27 minute period. Two employees were placed on temporary restriction; however, neither was found to have inhaled significant amounts. Damage was estimated at about \$29,000.”

“Radioactive Release (Portsmouth; August 6, 1975; type B)
Electrical problems resulted in erratic heating of uranium hexafluoride and a blocked copper tube. The tube ruptured and allowed about 2.0 pounds of uranium (enriched to 97.5 percent uranium-235) to escape over a 5 to 25 minute period. Although 17 workers inhaled more than the permissible amount of uranium, DOE did not consider any to have received a significant dose. Damage was estimated at \$28, 310.”

“Valve malfunction resulting in radioactive release (Portsmouth; November 10, 1975; type B)
After an August 5, 1975 release, new operating procedures were implemented but, in this case, were not followed. A connection was made with only one gasket rather than the required two, and when the valve was opened, about 23 pounds of uranium enriched to 97.5 percent uranium-235 escaped. The leak lasted 46 minutes because of inoperable safety equipment. No employees received what was considered to be significant exposures, and total cost of the accident was estimated at \$101,127.”

-from pages 7, 8

June 26, 1975 Interdepartmental Correspondence GAT-521-75-113

Subject: **SAFETY PROCEDURES FOR HANDLING TECHNETIUM-CONTAINING MATERIALS**

“Cascade samples from Area 6 have recently been found to contain excessive amounts of technetium-99 (Tc99), a potentially hazardous element because of its beta (B-) radiation. During June 16-20, 1976, multigram deposits removed from the Inlet lines and valves to the Freon Degradier were found to consist of 20 percent Tc99 by weight.

While safe procedures for dealing with materials containing enriched uranium are standard practice at GAT, technetium contamination is a new and separate problem. The unfamiliar nature and unexpected presence of large quantities of Tc99 demand that special precautions be taken by plant personnel who must handle cascade equipment or materials contaminated with technetium.

Please initiate the necessary action to define the scope of the technetium hazards problem and specify safe procedures for sampling, storage, and disposal of technetium-bearing materials from operations involving cascade equipment maintenance to laboratory testing.”

October 2, 1975 Interdepartmental Correspondence GAT-242-75-121

Subject: **TECHNETIUM IN X-705 EFFLUENTS**

“Need for Immediate Action”

“As we have discussed, the beta gamma activity in the east drainage ditch has increased astronomically during September. The Chemical Analysis Department has identified the major source of this activity as beta radiation from technetium-99. The technetium activity in our Station 11 composite water samples during 1975 are shown in Figure 1. Station 11 is located on the east drainage ditch immediately before it joins with Little Beaver Creek.

The weekly sample collected on September 29th showed a technetium activity of 67,600 d/m/100 ml (1.79 ppm Tc). This weekly-average value is 101.5 percent of the recommended concentration guideline² (RCG) for uncontrolled areas published in ERDAM 0524. It is also over 300,000 times the radiation limit specified by the State of Ohio (100 picocuries beta/liter). Note, however, that the State and ERDA standards are based upon instantaneous concentrations. I would guess that our peak Tc concentration is probably 20 times the average value. Therefore, we may exceed the ERDA standard by a factor of 20, and the State standard by a factor of 6 million.

In the past the ERDA-ORO Environmental Protection Branch has been concerned if we discharge effluents that are only a few percent of the RCG. They are very concerned about the current situation; their major concern is that there may be “immediate repercussions from the Ohio EPA.” The Ohio EPA has harried ERDA in the past about our radiological effluents exceeding state limits. The State is complaining about liquid effluents that have contained less than 1 curie/year including all radioisotopes, but the State has not yet learned that in September alone we have lost about 45

curies of technetium. However, note that we now are required to send the Ohio EPA a complete quarterly report of our radiological effluents; the first report will be sent near the end of October.”

INDEPENDENT INVESTIGATION OF THE PORTSMOUTH GASEOUS DIFFUSION PLANT, VOLUME I - MAY 2000

“External conditions and influences have had a significant effect on the ES&H-related behavior and intentions of both management and workers at PORTS, especially during the first two decades of operation. When PORTS began production activities, World War II and the Korean conflict had recently ended, and the Cold War was a reality. The work being done was classified, involved high technology, and was important to the national defense. The “need to know” was an ingrained security policy that had a major effect on attitudes toward sensitive operations and materials. Management and the Atomic facilities, were largely self-regulated, and guidance and regulatory requirements were evolving. Significant industrial and environmental legislation that would focus attention and actions toward greater protection of workers and the environment was not enacted until the 1970s.”

“Although Plant management was aware since the 1960’s that transuranics and fission products had been introduced into Plant facilities as early as 1957, until 1975, radiological effluent monitoring was only conducted for uranium isotopes and related indicator parameters. In 1975, technetium, and subsequently transuranic contamination, was unexpectedly discovered in liquid effluents from X-705. Technetium was also detected in airborne discharges. This discovery triggered significant long-term efforts by Plant personnel to isolate sources of technetium and transuranic contamination, develop or improve control methods, and establish appropriate monitoring protocols.”

“In the mid-1970s, the first evidence of technetium-99 began to appear in X-326 equipment. Some of the instruments became heavily contaminated with uranium compounds and technetium-99. Reportedly, the majority of space recorder background radiation came from technetium-99 that had plated out in the system. Instrument mechanics reported its frequent presence in instrument lines as a dark, goeey sludge having the appearance of black tobacco juice. The presence of technetium-99 resulted in significant clothing and personnel contamination and was difficult to remove.”

-from pages 2, 4, 47, 56

MEMORANDUM (MEMO GAT-922-76-184)

“A 1976 memorandum identified transuranics as a problem at PORTS, especially in the oxide conversion process.”

6-23-77 GAT-920-77-64 Subject: **THE UNION’S EXPRESSED CONCERN OVER RADIATION AND RADIOACTIVE CONTAMINATION**

“The Company relies upon the Industrial Hygiene and Health Physics Department to measure levels of contamination in work areas. Employees working in the area are not expected to make such surveys; therefore, survey meters have not been made available to them.”

“It is true that employees are not told the exact levels of radioactive contamination in the areas in which they are working. With proper understanding of radiation and contamination—such as the employees are getting in the new training course—the employee’s concern is whether or not the contamination or radiation in the area is less than that considered safe for a working area. The IH & HP Department makes those decisions.”

“It has been the failure to close down existing ventilation systems rather than the lack of ventilation that has been responsible for the spread of released materials.”

“Control of contamination in lunchroom or dining facilities has been a problem.”

“It is true that evacuation procedures and monitoring station procedures are not always clearly understood or followed.”

-from pages 3, 4, 5

July 11, 1980 REPORT BY THE COMPTROLLER GENERAL OF THE UNITED STATES

“Department of Energy’s Safety and Health Program For Enrichment Plant Workers is not adequately implemented.”

“Safety and Health Inspections Not Conducted”

“When inspections have been conducted, they have not included checking radiation levels in the plant. Thus, DOE cannot be sure that it is aware of potential hazards and take prompt action to eliminate or mitigate the risk of accidents. A March 7, 1978 release of more than 10 tons of liquid uranium hexafluoride from a ruptured storage cylinder at the Portsmouth, Ohio enrichment plant may have been avoided, had the Department conducted on-site inspections and discussed safety and health concerns with employees.”

“A vehicle carrying a 14-ton cylinder containing liquid uranium hexafluoride failed. The cylinder was dropped and ruptured, releasing 21,125 pounds of uranium in about 5 minutes. No employees were exposed in excess of maximum limits; damage totaled \$368,350. A report on the accident indicated the vehicle was in extremely poor condition and that many cylinders had been previously

dropped. The report also stated that under less favorable conditions, this type of accident would have resulted in injuries and/or fatalities.”

“Operations at the three enrichment plants since the 1940’s have resulted in 240 releases of radioactive materials containing 1 kilogram (about 2.2 pounds) or more of uranium. Forty-one of these releases occurred at the Oak Ridge plant; 88 at the Paducah plant; and the remaining 111 at the Portsmouth plant.”

“In addition, a small number of releases occurred involving uranium oxide and uranyl nitrate. Even so, these figures do not represent every release of radioactive material. Releases of less than 1 kilogram are not included, and a list of such releases is not available for Paducah and Oak Ridge. The Portsmouth plant has experienced about 170 additional releases of between 1 gram and 1 kilogram of uranium.”

“Causes of such releases vary widely. More than half of the releases at Portsmouth resulted from various mechanical failures, including valve failure and failed lines and gaskets. About 15 percent of the Portsmouth releases resulted from corrosion (primarily liquid storage cylinders), and 7 percent involved human error. At least six releases resulted from dropped storage cylinders.”

“Under DOE policy, operations shall be conducted in a manner to assure that radiation exposures are limited to the lowest levels technically and economically practicable.”

-from pages ii, 10

INDEPENDENT INVESTIGATION OF THE PORTSMOUTH GASEOUS DIFFUSION PLANT, VOLUME I - May 2000

“The largest release was in 1978, when over 13,000 pounds of UF₆ was released to the environment when a 14-ton cylinder dropped from a transporter and ruptured, emptying its contents.”

“Documents reviewed for the first quarter of 1978 indicated that “Based on the weight analysis via fluorimetric detection and the monitoring frequency it is possible to exceed, undetected, the maximum permissible weekly uptake.” The documents also indicated that samples were collected and analyzed for technetium. Correspondence dated as late as 1988 related to oxide repackaging stated that “Oxides of uranium are known to have different chemistry from the uranium fluoride compounds generally encountered at the site. The current urine monitoring program is not adequate to detect significant exposures to uranium oxides in a timely fashion.” This correspondence also noted that “available analysis of the oxide does not include sufficient information to determine whether exposure controls are appropriate since they are based on (transuranics) being insignificant for the purposes of dose assessment and control.”

“On September 13, 1978, Health Physics recommended shutting down X-705E due to unacceptable health risks (workers were subjected to these health risks from 1957 to 1978 – 21 year period).”

“On October 1, 1978 The Oxide Conversion was placed in a standby status.”

“December 14, 1978, Goodyear Atomic Corporation requested cancellation of the Oxide Conversion Project.”

“A radioactive contaminated acid cleaning solution entered the plant process system through a leak in a heat exchanger that was being used to heat the solution. Radioactive contamination was transported to the steam plant and to steam piping across PORTS. Today, many parts of the steam plant remain contaminated from this event.”

-from pages 20, 38, 47, 50

September 18, 1979 - INVESTIGATIONS OF HEALTH AND SAFETY CONDITIONS AT PORTSMOUTH GASEOUS DIFFUSION PLANT

“Process operators have the responsibility to test for the presence of UF₆ before releasing the piece of equipment to maintenance. The Health Physics Department should be informed if the test is positive (presence of UF₆ or UO₂F₂). This procedure is bypassed by first line supervisors (foremen) and equipment tested positive for UF₆ is released to maintenance for hotcutting and removal.”

“The investigation found that process operators sample for the presence of UF₆. Procedures require that the system will not be cut into with a UF₆ positive (more than 10 ppm UF₆). There is no requirement to notify health physics if a negative (less than 10 ppm UF₆) cannot be obtained.”

INDEPENDENT INVESTIGATION OF THE PORTSMOUTH GASEOUS DIFFUSION PLANT, VOLUME 1 - May 2000

“In 1979, isotopic analysis of two cascade deposits revealed relative high concentration of neptunium-237 (i.e., 55 percent and 60 percent of the total alpha activity in the samples was due to Np-237, respectively). However, there was no indication of a change in the radiological control program to address this issue, even though data was available to indicate that some level of transuranic contamination was present in the cascade. Transuranic sampling for work planning and control was not actively conducted until the 1990s.”

“In 1979, a release in the X-705 annex during disassembly of a converter resulted in the internal contamination of six workers with technetium levels as high as five times the Plant restriction levels (but not in excess of regulatory limits).”

“In 1980, surveys showed that portions of X-326 met the criteria for a red job area but was not categorized as such.”

“In 1980, analysis of cascade deposits confirmed the presence of neptunium and plutonium in the process system. These data indicate that, while Goodyear Atomic Corporation management was aware of both transuranics and technetium contaminants from incoming feed materials, they failed to recognize or evaluate potential radiological problems resulting from their concentration in the cascade.”

“The State of Ohio mandated closure of important site landfills and the incinerator in the late 1980’s and early 1990’s. because of concerns over continued disposal of regulated wastes. The Plant ceased offsite shipment of radioactive waste, and without approved commercial treatment and disposal facilities, large amounts of radioactive waste, mixed hazardous and radioactive waste, and radioactively contaminated PCB waste accumulated and were stored on site; much of this waste remains in storage today. Numerous inspections and appraisals by the State of Ohio Environmental Protection Agency (EPA), DOE (e.g., Tiger Team assessment), OR, and internal organizations identified performance problems in the treatment, storage, and disposal of hazardous waste. By 1988, the State of Ohio EPA sent DOE and the Plant a notice of intent to file suit for hazardous waste violations.”

“Despite the discharge restrictions, legacy environmental contamination exists in ponds, local ditches, and streams.”

“While it is likely that PORTS air emission estimates were done in good faith, these estimates did not reflect all the potential historical releases, including some that could have been significant such as cell jetting. Evidence of contamination on roofs and grounds and recurring high workplace air sample results in various locations, such as the oxide conversion facility, point to significant unmonitored releases that had not been previously included in monitoring results. The Plant did not perform continuous vent monitoring of radionuclides or fluorides until the mid-1980s, and previous methods for estimating releases have been shown to be unreliable and in some cases non-conservative.”

“Fluorine and fluoride compounds were used in significant quantities at PORTS and both by design and by accident were vented to the atmosphere. Plant personnel have repeatedly complained of offensive fluorine fumes, breathing difficulty, and respiratory tract damage from releases at the fluorine generating facility and process buildings. The PORTS medical department rarely confirmed significant health effects, but confirmatory surveys to establish release concentrations provided unreliable results due to the rapid dissipation of released gases. Continuous environmental monitoring for fluorides has been conducted for many years, and ambient samplers sometimes indicated fluoride concentrations that exceeded release limits.”

“From the early 1980s until the middle 1990s, guard force personnel performed security drills without protective clothing in spaces that were radiologically and chemically contaminated, while workers in these same spaces generally used such protection.”

“Testing in 1986 identified inaccuracies with the UF6 negative test protocol and the strong possibility of false negatives. Consequently, when equipment was removed for maintenance, outgassing was common, despite an earlier determination of UF6 negative.”

-from pages 4, 5, 18, 20, 35, 40, 52

TIGER TEAM REPORT 4-1990 “TRANSITION FROM AN INDUSTRIAL ENVIRONMENT TO A NUCLEAR ENVIRONMENT”

“Many operations and maintenance activities at PORTS involved hazardous conditions and the potential for exposure of personnel to physical, radioactive, and chemical hazards. Enrichment

facilities with the potential for such exposures included the cascade and other process buildings; a feed manufacturing plant; an oxide conversion plant; decontamination, cleaning, and uranium recovery facilities; a smelter; and incinerators. Leaks and off-gassing from process equipment or components being repaired or replaced exposed workers to airborne uranium, transuranics, fission products, fluorine, and hydrogen fluoride (HF) gas.”

September 15, 1993 - HEALTH PHYSICS TECHNICAL GROUP MEMO HT-93-27

Subject: **REVIEW X-705 CYLINDER DRYER OVEN AREA
SAFETY & HEALTH COMPLAINT #701-137 (6-17-93)**

“Upon collection of air samples that exceeded administrative control levels, Health Physics advised operations to discontinue use of a pressurized air hose for drying cylinders by forcing air through the cylinder.”

“IMPACT: Internal doses to workers in this area are under-estimated. Historically, X-705 personnel internal exposures have ranged up to 35 mrem. Assigned exposure could be under-estimated by as much as a factor of fifty. For example, as a worst case, an individual continuously exposed to 25% TRU material, whose estimated internal dose from uranium was 35 mrem, would have actually received 1750 mrem.”

**INDEPENDENT INVESTIGATION OF THE PORTSMOUTH GASEOUS DIFFUSION PLANT,
VOLUME 1 - MAY 2000**

“The AEC, the Environmental Research and Development Administration (ERDA), and DOE have always had a site presence at PORTS. But until 1989, had limited ES&H oversight capability or responsibility. OR conducted very cursory annual safety and health program appraisals from 1957 to at least 1980. However, these appraisals typically involved two or three persons for three or less days on site “addressing” a broad scope of ES&H functions, as well as corrective actions from previous appraisals. There was little evidence of field observation in these appraisals.”

“Although the Plant appeared to be responsive to the concerns and recommendations raised by OR, root causes and programmatic issues were rarely identified and addresses; the adverse conditions and performance reoccurred, or remained uncorrected in other Plant areas. In the 1980s, OR ES&H oversight became more rigorous and proactive, especially after the Tiger Team assessment in 1989 identified significant programmatic deficiencies and unsafe conditions and performance in the Plant. The AEC and its successors also investigated worker allegations of unsafe conditions and practices, but with inconsistent rigor and effectiveness. A 1980 review by the General Accounting Office sharply criticized DOE oversight of ES&H at the gaseous diffusion plants.”

“Goodyear Atomic Corporation management oversight of ES&H was reactive and often ineffective, as reflected in continuing ES&H problems through the years. The Plant responded well when Federal and State regulators raised major concerns or when new regulations were issued, implementing corrective actions and developing new programs and controls. However, Plant management often failed to ensure that ES&H staff recommendations were executed, or that ES&H requirements were implemented and enforced by first-line supervision.”

“Due to weaknesses in monitoring programs, such as the lack of extremity monitoring, exposure limits may have unknowingly been exceeded. In addition, communication of hazards, the rationale for and use of protective equipment use were inadequate.”

“Environmental practices prior to Federal and State legislation in the 1970s and 1980s resulted in many adverse impacts to the environment, although essentially all on Federal property. AEC/ERDA/DOE and contractor management failed to proactively identify ES&H vulnerabilities, clearly communicate high expectations for ES&H performance, and implement consistent, effective corrective actions to known problems. Management also failed to ensure that hazard controls were implemented by supervisors and workers, resulting in additional and higher exposures to personnel and continuing unnecessary radioactive contamination.”

“In 1998, OSHA cited USEC for failing to preserve and maintain records of employee exposure of all employees for at least 30 years. OSHA found that “records of radiation exposures for all company employees were not adequately maintained from 1993 to 1995 in that some employees’ exposures were arbitrarily assigned and based solely upon their past exposures which may have differed from exposures experienced during the period relating to the assigned dose.”

-from pages 5, 6, 37

April 21, 1994 X-100, MS-1213, PORTS (3841)

Subject: **POTENTIAL CIVIL PENALTIES FOR RADIATION PROTECTION PROBLEMS**

“Review of Documentation of the NRC Action at the LaSalle County Station and Comparison of the Reports Against Recent Events at PORTS. Conclusion: PORTS Has the Same Potential As LaSalle.”

“This statement is made based on the review of the X-705 ALARA Review conducted in March 1994. The lack of engineering controls, pre-job meeting and failure to recognize the potential spread of contamination are parallel.”

“August 18, 2003 Reference No. PR-PTS-03-02876 X-343

“Two protective Force received an uptake of fumes (HF) in a letter dated 10-28-2003 from Greg Goslow states that uranium emissions from the X-343 Cold Trap Vent exceeded both the first and second plant action levels (PAL) during the month of July and August 2003. Mr. Goslow added that uranium emissions reached over 30 times the baseline effluent quantity, which is 30 times greater than the expected amount of emissions.”

X-326 BUILDING RADIOLOGICAL PROFILE

Radiological contamination has been a major problem in the X-326 over the years. Numerous releases have caused this contamination problem.

The major contamination came from two sources: **ERP STATION**
HEU SUSPENSION PROJECT

I. ERP STATION

ERP Station compressor failures on the cell floor. The ERP Station operates at above atmospheric pressure and when these leaks occur, the ventilation system picked up airborne contamination and circulated these particles from the cell floor to the operating floor. The magnitude and duration of these releases determined how much of the building became contaminated. Some releases contaminated the entire building.

PORTSMOUTH GASEOUS DIFFUSION PLANT, VOLUME 1; PAST ENVIRONMENT, SAFETY, AND HEALTH PRACTICES, May 2000 – p. 35

During the 1960s, the PORTS Health Physics group became concerned with increasing alpha radiation levels in process and support facilities at the site. While no records were identified to demonstrate that this issue was satisfactorily resolved, the period coincides with the processing of recycled uranium at the Paducah Plant. In 1979, isotopic analysis of two cascade deposits revealed relative high concentration of neptunium-237 (i.e., 55 percent and 60 percent of the total alpha activity in the samples was due to Np-237, respectively). However, there was no indication of a change in the radiological control program to address this issue, even though data was available to indicate that some level of transuranic contamination was present in the cascade. Transuranic sampling for work planning and control was not actively conducted until the 1990's.

August 27, 1962, GAT-810-62-54 - Interdepartmental Correspondence

Subject: **HEALTH PHYSICS PHILOSOPHY AS A GUIDE FOR HOUSEKEEPING PROBLEMS IN PROCESS AREAS**

“Ben Kalmom has refined the Health Physics philosophy on contamination problems involving housekeeping in the process areas and has prepared a procedure for determining the contamination index for the X-326 cell housings. His group is still working on procedures for the determination of contamination indices for the floor, top of compressor housings, and intercell housings. These procedures will be forthcoming. In the meantime, it would appear that the general philosophy presented can be adapted to the conditions in the area using our good judgment to see that it's provisions are maintained.

The general philosophy should be passed down to the foremen for their use as a guide in handling housekeeping problems involving contamination considerations. We don't expect or desire that the philosophy will be openly discussed with bargaining unit employees. Calculations of contamination indices should be handled by the General Foremen and kept as supervisory information to help in deciding the need for decontamination.

June 26, 1975, GAT-521-75-113 - Interdepartmental Correspondence

Subject: **SAFETY PROCEDURES FOR HANDLING TECHNETIUM-CONTAINING MATERIALS**

“During June 16-20, 1975, multigram deposits removed from the inlet lines and valves to the Freon Degradar were found to consist of 20 percent Tc by weight.”

“While safe procedures for dealing with materials containing enriched uranium are standard practice at GAT, technetium contamination is a new and separate problem. The unfamiliar nature and unexpected presence of large quantities of Tc demand that special precautions be taken by plant personnel who must handle cascade equipment or materials contaminated with technetium.”

January 20, 1977 - ERDA Investigation

Subject: **ERDA INVESTIGATION**

“Employee Complaint re: Technetium Close Out Conference held with ERDA Inspectors: Mike Kanazawitch, Richard Smith, and B. J. Davis -- Attending for the Employees were W. J. Fields, Local Union President; C. A. McNelly, Local Union Vice-President; and Local Union Steward, J. G. McCollum.

At X-326 Building, Cell 25-7-18 in June 1976, there was widespread technetium contamination. C. Spradlin of Health Physics for GAT stated that X-326 was hot halfway down the building. Several maintenance personnel were exposed and went on restriction on June 18, 1976 and were taken off restriction on June 23, 1976. We were informed at the January 20, 1977 meeting that Yelley had a body count of 79,000 and Schuller a 57,000 body count.”

February 8, 1980, Operating Specification CN 11.1

Subject: **GUIDELINES FOR NON-EMERGENCY ACCESS CONTROL OF X-326 BUILDING**

“1.0 SCOPE

Surveys conducted by IHHP indicate that parts of the X-326 Building have surface contamination levels sufficient to require decontamination. Aside from certain well-defined ground floor areas, the contamination is confined to the cell floor. A decontamination crew has been assigned and dedicated to the building. Boundaries have been established, using barricade tape and signs that indicate the contaminated area.”

May 8, 1980, Interdepartmental Correspondence

Subject: **PHASE II INVESTIGATION OF HEALTH AND SAFETY CONDITIONS AT PORTSMOUTH PLANT**

P. 3, #6. "Expedite the decontamination of Building X-326 and institute procedures to reduce further contamination and require immediate cleaning should an area become contaminated in the future (see Allegation 2A)."

P. 18, ALLEGATION 2A: "It is alleged that a survey conducted by the company on Building X-326 revealed a much higher level of contamination than was indicated to the Union safety representative. A Business Confidential Report No. GAT-923-78-297C supposedly contains the correct reading which indicates that the building was on the border line of a "red job" status."

FINDINGS: "The referenced report (GAT-923-78-297C) does exist and it does indicate that the cell floor of Building X-326 should be classified as "red job" area. The Committee finds that Goodyear did not completely or timely implement the recommendations of the report."

P. 19: "When questioned about how this building became contaminated, middle management stated it was due to a decrease in the timely decontamination of areas after maintenance and/or releases. This change began in the mid-1960's more or less coincidental with reduced operating levels in the Plant.

The Committee concludes that these practices, specified above, exhibit a failure on the part of management to assign a sufficiently high priority toward contamination control."

July 11, 1980, Report By The COMPTROLLER GENERAL of The United States

Subject: **DEPARTMENT OF ENERGY'S SAFETY AND HEALTH PROGRAM FOR ENRICHMENT PLANT WORKERS IS NOT ADEQUATELY IMPLEMENTED**

"The Department of Energy's (DOE's) program to protect the safety and health of employees at its contractor-operated uranium enrichment plants has not been fully implemented by DOE's Oak Ridge Operations Office. Appraisals and inspections of plant conditions are not as frequent and/or as thorough as required. Instead of independently investigating employee complaints, DOE has delegated this responsibility to the contractor"

P. 23 (X-326) "In another example, the lack of inspections and inadequacy of appraisals allowed a situation to exist for nearly 1 ½ years before corrective action was taken. On October 24, 1978, contractor safety and health personnel at the Portsmouth plant issued a report, which stated that one area of a building was highly contaminated. The report recommended that the area be classified as a "red job" area *1/ and that decontamination procedures begin. The contractor took no immediate action. In September 1979, the contractor's safety and health staff again found the area to be contaminated and made the same recommendation contained in their earlier report. The contractor again took no action. Oak Ridge Operations Office safety and health officials informed us that they were aware of the contamination problem but thought that corrective action was underway. They also indicated

that the decision to operate the area as a “red” area would be a management decision. Discussion with employees working in the contamination area revealed that they were not aware of the contamination.

Finally, in January 3, 1980, an employee was told of the results of the September 1979 contamination survey. On January 7, 1980, the Oil, Chemical and Atomic Workers Union requested that the area be designated as a “red job” area. The contractor refused, citing a contamination survey conducted by the contractor’s production group, which showed contamination below the “red job” level. The union requested a copy of the production group’s survey but was refused, even though DOE regulations require that such surveys be available to employees. On January 22, 1980, the union filed a complaint with Oak Ridge Operations Office which, after investigation, determined that the area should be designated as a “red job” area and that decontamination should begin.

DOE appraisals or inspections should have revealed this problem. Knowing of the contamination, appraisals should have included reviewing decontamination procedures underway. This effort would have revealed the contractor’s lack of action. In addition, inspections, which included radiation monitoring in addition to non-radiological safety and health concerns, could have revealed the continuing contamination levels. Inspectors, aware of the contamination problem, could also have learned of the contractor’s lack of action by interviewing plant employees in the contamination area.

*1/A “red job” area involves the issuance of company-owned protective clothing, additional shower time, etc., to avoid the contamination of employees and the spread of the contamination from the “red job” area.”

May 1990, P.40 & 41 - CONTAMINATION CONTROL (OOESH) VOL.I, DOE

“Records of radiation and contamination surveys were readily available from the start of plant operations. Survey records for all major buildings indicate contamination levels above limits over many years. Recommendations for decontamination of locations exceeding PALs were typically made and noted by Industrial Hygiene and Health Physics personnel on the survey forms. In some cases, follow-up surveys noted that areas continued to be contaminated above limits, with continued recommendations for decontamination. However, rigorous enforcement of decontamination requirements was not evident.”

“As early as 1955, permanent Red Job areas included portions of X-705, X-744G, X-342, X-344, and X-746. Classification of other areas was subject to change based on survey results. In some cases, classifications were not performed correctly. In 1980, surveys showed that portions of the X-326 met the criteria for a Red Job area but were not categorized as such. A Union grievance was filed and an investigation was performed to review the matter. Other problems with this classification system included the lack of formal restrictions on movement of personnel and equipment in and out of contaminated areas. In 1977, Industrial Hygiene and Health Physics noted that employees wearing contaminated clothing were permitted to enter clean areas such as the cafeteria, and individuals were allowed to eat and smoke in contaminated areas. A change in Goodyear Atomic Corporation standard practice procedure SPP H-8, “Health Protection Measures for Red Orange and Contaminated Job Assignments, was proposed at that time. In 1979, Goodyear Atomic Corporation established a Contamination Control Steering Committee to review the overall

contamination control program at the Plant and make recommendations for implementation of a more effective and uniform policy. Contamination control problems continued to persist into the late 1980s. Although Goodyear Atomic Corporation management and the Industrial Hygiene and Health Physics Department were concerned about the need to control contamination levels as low as reasonably achievable (ALARA), contamination control policies and procedures were not fully effective, as evidenced by continuing radiological problem reports and PORTS emphasis on corrective actions that lasted into the 1990s. These deficiencies are likely to have resulted in additional exposures and spread of contamination over the plant operating history.”

May 8, 1980, Interdepartmental Correspondence

Subject: **PHASE II INVESTIGATION OF HEALTH AND SAFETY CONDITIONS AT PORTSMOUTH PLANT**

P.3, #6, “Expedite the decontamination of Building X-326 and institute procedures to reduce further contamination and require immediate cleaning should an area become contaminated in the future (see Allegation 2A).

April 25, 1990, FINAL TIGER TEAM ASSESSMENT FOR THE PGDP, P. ES-3 (X-326)

“Contamination control is a major concern at PORTS. Efforts have been underway to reduce contamination levels in the major process building. Inadequate contamination control and occupational safety practices in three PORTS maintenance support facilities were considered sufficiently serious to warrant immediate corrective measures by the contractor. These measures were accomplished while the Team was on site. A breakdown in standard workplace controls was found in these facilities, with widespread evidence of eating, drinking, and smoking in contaminated areas; a lack of routine contamination surveys being conducted; and little follow-up and accountability to contamination surveys and tagging. The larger issue of upgrading the PORTS contamination control program is being addressed in the implementation plan for DOE Order 5480.11 (Occupational Radiation Protection).

Occupational safety concerns centered on basic Occupational Safety and Health Administration (OSHA) and DOE requirements and procedures not being implemented in the workplace. Although many of these requirements and procedures are prescribed by the PORTS Safety Manual, they are neither understood by workers, nor enforced by supervisors. Unsafe practices requiring prompt abatement were observed during Team member walk-throughs. Management is cognizant of the scope of these deficiencies (raised in an earlier ORO appraisal) and is determining how best to implement an OSHA compliance program consistent with the Secretary’s 10-Point Initiative.

Management from MMES has recognized that the PORTS safety analysis report (SAR) is inadequate. It is being revised, although the time frame for completion (FY 1994) seems protracted. Derivative operational safety requirements (OSR’s) are not clearly prescribed; written procedures to define acceptable conduct of operations in the context of OSRs and DOE requirements are incomplete and not consistently enforced. The formality and discipline that guide typical nuclear operations are lacking at PORTS, a root cause for many findings.”

May 2, 1995 POEF-050-95-053

**Subject: CONTAMINATION CONTROL SUBCOMMITTEE MEETING MINUTES
FROM 4/21/95**

“Conclusions by item:

2. Decontamination of the X-326 Building for contaminated area reduction efforts. It was the desire of the committee that progress in this area continue. Herman R. Potter agreed to follow up on the elevator issue for the X-326 Building. Costs and schedule for completion are two of the items to be included in the follow-up. Ron Smith agreed to follow up and determine what action is required to get Mike Gill released for work on the Contaminated Area Reduction Subcommittee for work in the X-326 contaminated area reduction.

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p.39 & 40, 31.1.8 Contamination Control “Records of radiation and contamination surveys were readily available from the start of the plant operations. Survey records for all major buildings indicate contamination levels above limits over many years. In some cases, follow-up surveys noted that areas continued to be contaminated above limits, with continued recommendation for decontamination. However, rigorous enforcement of decontamination requirements was not evident.

Areas were categorized as “Red, Orange, or Clean” as early as 1955. Permanent Red Job areas included portions of X-705, X-744G, X-342, X-344, and X-746. Classification of other areas was subject to change based on survey results. In some cases, classifications were not performed correctly. In 1980, surveys showed that portions of X-326 met the criteria for a Red Job area but were not categorized as such. A union grievance filed resulted in a dedicated crew assigned to decontaminate X-326 to avoid classifying X-326 as a Red Job area.”

p.48, Jetting/Venting “There were times when UF₆ was inadvertently/deliberately vented from purge facilities.”

p. 82, “Technetium-99 is a weak beta emitter with a radioactive half-life of 213,000 years and was introduced as PORTS in recycled reactor feed. The primary exposure pathways are ingestion or inhalation. Protective clothing would adequately shield the low-energy beta particles emitted by technetium. Technetium passed through the Paducah cascade as a volatile compound of fluorine, depositing on internal surfaces of the cascade and contaminating the uranium product. Similarly, technetium at PORTS contaminated many areas, including cascade equipment. The AEC did not specify a limit for technetium in UF₆ feed but controlled the concentration of technetium indirectly to about 10 ppm by limiting gross beta due to fission products. In addition, some customers established a 10 ppb limit on technetium in product cylinders. There was evidence that workers had some exposure to technetium.”

Comment *Even though it tended to concentrate at the top of the cascade, Technetium was a major problem throughout the cascade and other buildings.

II. HEU SUSPENSION PROJECT IN X-326

June 5, 1992 - HEALTH PHYSICS RADIOACTIVE CONTAMINATION SHEET HEALTH PHYSICS SURFACE CONTAMINATION SURVEY

December 8, 1992 - Internal Correspondence, POEF-160-92-634

Subject: **X-326 PERFORMANCE INDICATOR REVIEW**

“(2) The percentage of positive bioassay samples for individuals assigned to the X-326 has almost tripled. This increase was first noticed in June with a major occurrence of positive bioassay sample happening in August.”

“(4) The X-326 1992 Air Card Program summary shows a significant increase during August and September, from 0.03% of the derived air concentration (DAC) to 0.2% of the DAC. From the RADCON Manual, an area with an airborne radioactivity concentration of 10% of the DAC would require respiratory protection.”

“The following occurrences also indicate the X-326 radiological conditions have degraded to a point that the HEU Suspension Project should be re-evaluated.

- (1) The X-326 Berthold results indicate 110 instances of detectable contamination from November 18 through December 1.
- (2) Instances of removable contamination in the ventilation ducts due to facility design. This condition can exist in all process buildings, but is highlighted due to the higher assays in the X-326.
- (3) Numerous reports of minor “out-gassings” and/or releases.
- (4) Instances of individuals not clearing the Berthold monitors when exiting the building.”

December 10, 1992 - Internal Correspondence, 814-92-86

**Subject: ACTION PLAN TO ABATE AIRBORNE AND SURFACE CONTAMINATION
LEVEL INCREASES IN THE X-326 BUILDING**

“We have analyzed the X-326 Building to evaluate what change may have caused the increases in contamination levels. It is our conclusion that the primary source is from the cells that are shut down, but not at a negative and held atmospheric pressure. This allows process gas (PG) and technetium (Tc-99) in the cell to escape as minor pressure changes occur (due to changes in atmospheric conditions, temperature, or operational changes of cell pressure), allowing PG into X-326 cell floor atmosphere. This condition exists in fifty-five cells as of today.”

Comment *It should be noted that these fifty-five cells were spread out over the entire building; therefore, there was airborne and surface contamination over the entire building.

December 14, 1992 - X-326 AIRBORNE/CONTAMINATION ABATEMENT

December 18, 1992 - Internal Correspondence

**Subject: ACTION PLAN TO ABATE AIRBORNE AND SURFACE CONTAMINATION
LEVEL INCREASES IN X-326**

“This condition started developing in July of this year as preparations for the Highly Enriched Uranium (HEU) suspension project resulted in an upset to the normal cascade configuration and concluded with a large number of cells off stream without UF₆ negatives.”

“There are several factors considered in establishing priorities for obtaining cell negatives. Those cells with good leak rates (maintain pressure below atmosphere) will be at the bottom of the priority list for obtaining a negative. Those with bad leak rates become the higher priority for negatives. The following factors must be considered in prioritization; grams of U-235 in the cell, visual evidence of outgassing, maintenance required to repair cell leaks, permits and radiological boundaries.

II. Actions:

5. All suspect cells were inspected for evidence of outgassing by looking for deposits. There were several cells identified as having outgassed in the past.

6. A meeting was held to discuss the impact upon the cascade and nuclear criticality safety concerns. Management assessed the need to rapidly stop the source as the number one priority. Also discussed were how premature excessive restrictions and personal protection would hinder the rapid achievement of the number one priority, ultimately resulting in increased overall exposure before the problem is resolved.

15. Cell negative priorities will be established by first determining leak rates. Then cells with bad leak rates will be evaluated based upon visual outgassing evidence (deposits), and U-235 mass in the cell. Cells with good leak rates will be maintained at about .5 psi below atmospheric pressure through meticulous monitoring and actions by operators.

January 6, 1993 - Internal Correspondence POEF-160-93-011

Subject: AIRBORNE RADIOACTIVITY SUMMARY OF THE X-326 BUILDING

“The need for increased loose surface contamination surveys and special airborne monitoring in the X-326 Building was deemed necessary by Health Physics supervision and started on December 11, 1992.”

“This data indicates the following:

1. The airborne concentration varied inversely with atmospheric pressure; as pressure went down airborne activities increased. This correlation still holds true; however, the increase in activity for the same change in atmospheric pressure is not as dramatic as compared to the increases noted when the special air monitoring program began on December 11.
3. Airborne concentrations are virtually the same on the operating and the cell floor. The operating floor has only slightly lower activity level.
4. Airborne concentration is virtually the same north to south. The south side of the building has only a slightly lower activity than the rest of the building.
5. Contamination levels are uniform throughout the building with the exception of the southwest corner of the building, which exhibits unusually high beta activity.
6. There were days when the overall airborne radioactivity concentration did exceed 10% of the DAC; however at no time was the airborne on average greater than 10% of the DAC for an entire workweek.

While the situation appears to have eased, a concerted effort to take the number of cells to a negative must be continued.”

February 9, 1993 - Internal Correspondence POEF-160-93-098

Subject: SUMMARY OF AIRBORNE RADIOACTIVITY STUDY PERFORMED IN THE X-326 BUILDING

“The need for increased loose surface contamination surveys and special airborne monitoring in the X-326 Building was deemed necessary by Health Physics Supervision.”

AIR SAMPLING

1994 NIOSH HEALTH HAZARD EVALUATION REPORT NO. 94-077-2568

p. 19, “The location of the samples collected in the X-326 Building, which is at the product enriched end of the process and contains a higher of U235, presents radiological health hazards due to uranium which are not adequately addressed with the mass per volume airborne concentrations.”

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p. 39, 3.1.7 - AIR SAMPLING

“Portsmouth utilized a network of stationary air samplers at various production and non-production areas throughout the plant. Data documented frequent air sampling results in excess of Portsmouth limits. These above-limit samples typically were related to process upsets, equipment failure, or maintenance activities, and were valid high readings. Although log books indicated many dusty operations or smoky conditions (releases) in all buildings, most of these samples were related to operations in X-326 and X-705”

“Documents revealed that the methods/calculations pertaining to the air monitoring system contained three non-conservative assumptions: (1) constant sampling rates for the area air monitoring systems were determined to be non-conservative for over ten percent of the permanent sampling locations (primarily in X-705), which were noted as experiencing heavy dust loading that routinely resulted in lowering flow rates; (2) the absorption effect of the dust buildup on filters was not considered when the samples were counted, and relatively small amounts of dust on filters will prevent alpha radiation from being detected; (3) the air monitoring system utilized cellulose filters for sample collection, but the effect of particle penetration into the filter medium was not considered. This submersion of radioactive particles within the filter medium was discussed in ANSI N13.1, “Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities,” the consensus standard at the time. This guide stated that cellulose filter papers were not well suited for detection of alpha-emitting radioisotopes by direct counting.

It is evident that there were elevated airborne radioactive concentrations and non-conservative air sampling assumptions, coupled with continuing management and supervisory failures to actively enforce the use of appropriate respiratory protection divides. Additionally, workers were reluctant to use this equipment. Consequently, personnel exposures were likely during a variety of operations at PORTS”

NEUTRON DOSIMETRY

November 1996 and February 1997 - NIOSH HEALTH HAZARD EVALUATION REPORT
HETA 96-0198-2651 OF PORTSMOUTH GASEOUS DIFFUSION PLANT

p.13 & 14 HISTORICAL HEALTH PHYSICS PRACTICES - “In an effort to reconstruct past neutron exposures, the historical health physics monitoring and reporting practices were reviewed. LMUS and union personnel indicated that abnormal chip ratios and high doses (above 2.7 rem) were routinely assumed to be due to equipment failure (“bad badges”) and little effort was made by the Health Physics Department to investigate such doses. The 2.7 rem dose supposedly occurred in the early 1970s during the removal of a uranium deposit in the X-326 Building (high-assay). However, no report was found in reviewing the Health Physics Exposure Investigation Reports regarding this event. In addition, no such dose was found in reviewing the computerized Health Physics historical data provided by the site to NIOSH in support of the current epidemiologic study. Past recording and reporting activities applied to high doses were provided as reasons for the lack of historical documents and missing data. Recording decisions regarding high doses were based on the philosophy that doses of this size were very unlikely when compared with past doses reported and recorded at the site. Therefore, equipment failure was provided as the reason for the abnormal dose, and the recorded dose was entered as something other than the measured value. Official documentation of this policy for reducing assessed doses could not be found, however. A measured

dose of this size may be possible if the exposure occurred near a highly enriched uranium deposit. The "SLOW COOKER" phenomenon could explain doses in this range.

In addition, this review found that background measurements used to correct personal results have changed throughout time. Depending on the type of dosimetry system used, background was handled in one of three ways: it was calculated using statistics, manually entered into the dosimetry algorithm, or determined from badges in or near the working areas. All these methods have certain limitations. The latter may NOT represent true background exposures (especially if these locations were in elevated radiation areas). Another issue regarding reporting and recording practices involves doses that could not be linked to individuals. A computerized account, setup to store these "unlinkable" doses, is commonly called the "BUCKET DOSE" account. A cursory review of this account indicated that several person-rem could not be assigned to individual workers or visitors. Both approaches (background issues and BUCKET DOSE) reduce the reportable doses and will eventually lead to an artificially low dose history for the facility."

p.14 CONCLUSIONS - "This evaluation showed that a potential chronic low-level neutron exposure exists at this site where uranium is stored, handled, or solidified within the cascade. areas most likely associated with neutron exposures include the Feed and Withdrawal areas, cylinder storage yards, and places where uranium deposits are formed within the cascade. Job titles most likely associated with potential neutron exposures would be those involving routine tasks in potential neutron areas (listed in Table IV). Area neutron doses ranged from less than the detection limit (0.2 mSv) to 7.1 mSv and varied with the amount of uranium present, its enrichment level, geometric configuration, and time spent near the source. While the area measurements confirmed the presence of a chronic low-level exposure to neutrons, all personal doses were below the limit of detection. Recent neutron monitoring results conducted by the site have shown reportable neutron doses. Historical health physics programs (1954-1992) neither calibrated nor monitored for neutron exposures. Therefore, potential neutron doses have not been enclosed in the workers dose histories. Data from this evaluation were based on a small sample size and may reflect specific production and seasonal conditions during the 3-month period."

p.14 & 15 RECOMMENDATIONS - "The following recommendations are based on observations made during the survey and document reviews. They are intended to help ensure the safety and health of the workforce. These recommendations stem from the present understanding of the workers' occupational exposures and potential health effects associated with these exposures.

1. The area TLDs used by LMES (DOE contractor) should be used with an appropriate phantom material to monitor neutron exposures in the X-345 vault areas properly.
2. To ensure maximum efficiency in detecting neutrons, workers who are likely to be exposed to neutrons should be informed about the proper positioning of the TLD and its angular dependence in detecting incident neutrons.
3. The document entitled "D2O-Moderated Californium-252 Neutron Calibration Factor (K_{nd}) Determination" dated August 17, 1995, should be revised. A minor error in the calculation should be corrected. The Mean Net Test Response calculation used in Mean GROSS Test Signals instead of the Mean NET Test Signals as referenced in the text.³⁹
4. The linkage issues regarding the "BUCKET DOSE" account should be reviewed and corrected to improve record keeping and reporting activities. Where possible, the "BUCKET" doses should be assigned to individual workers.
5. Archive tapes should not be recycled to facilitate future dose reconstruction efforts for compliance or epidemiological purposes.

6. Area monitoring should continue to be performed in areas where uranium is routinely stored or handled to characterize potential neutron exposures better. In addition, efforts should be taken to evaluate potential neutron doses associated with known uranium deposits within the cascade.
7. Past maintenance activities and personnel involved in physically removing uranium deposits should be evaluated to provide better insight on the doses attributable to the SLOW COOKER phenomenon.
8. Administrative changes or decisions regarding issues in the health physics dosimetry program (doses below the limit of detection, abnormal chip ratios, investigative reports, etc.) should be better documented and routinely reported to the workforce to educate, inform, and solicit questions about how the changes or decisions will affect their dose records.”

February 17, 1998 - U.S. DEPARTMENT OF LABOR OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION CITATION AND NOTIFICATION OF PENALTY

Citation 1, Item 7, Type of Violation: **SERIOUS**

29 CFR 1910.1020(d)(1)(ii): “The employer did not preserve and maintain records of employee exposure of all employees for at least thirty years:

- a. Records of radiation exposures for all company employees were not adequately maintained from 1993 to 1995 in that some employee exposures were arbitrarily assigned and based solely upon their past exposures which may have differed from exposures experienced during the period relating to the assigned dose.
- b. Records of radiation exposures were not accurately preserved and maintained in that for the period of 1993 through 1995 some thermoluminescent dosimeters (TLDs) which were used to measure and create a record of employee radiation doses, were not evaluated and a zero dose was assigned to an employee where the exposed TLD which was assigned to the employee was damaged.”

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Decontamination and Uranium Recovery (X-705)

Since the Plant began operation, equipment was decontaminated and uranium was recovered from decontamination solutions in the X-705 (Decontamination Building). These activities were accomplished in areas that were physically separated from the oxide conversion areas.

The most significant occupational hazard in the X-705 was exposure from inhalation of airborne radioactive material. Radioactive materials in this building were often not contained, providing the opportunity for worker exposure. Spot checks by health physics personnel often found evidence of contaminated hands, shoes, and coveralls. Acceptable PALs for airborne radioactive material were exceeded more frequently in the X-705 than in other buildings. Radiological hazards were particularly significant in the X-705, because transuranic materials were concentrated by the uranium recovery and oxide conversion processes, and because insoluble forms of uranium were routinely handled. Transuranics and insoluble uranium were significantly more hazardous than the soluble uranium compounds that were the principle sources of radiation dose in other Plant areas. Prior to the mid-1970s, the health physics staff assumed that all detected radioactivity was uranium. This non-conservative assumption likely caused underestimation of the radiological hazards in the X-705.

Decontamination

A significant exception occurred in the late 1970s when a radioactive contaminated acid cleaning solution entered the plant process steam system through a leak in a heat exchanger that was being used to heat the solution. Radioactive contamination was transported to the steam plant and to steam piping across PORTS before the problem was identified and corrected. Today, many parts of the steam plant remain contaminated from this event.

Oxide Conversion (X-705E)

Over its entire period of operation (1957 to 1978), the oxide conversion process was probably one of the most hazardous radiological and chemical operations at PORTS.

A demonstration facility with a 3-inch flame tower was built and operated from 1958 through 1965, but was shut down due to health physics concerns and uranium material balance problems. Problems identified by an Oak Ridge health protection review in 1965 included potential concentration of transuranics in the processes, internal uranium exposures from enriched insoluble oxides that were not detectable by urinalysis, and inadequate air monitoring capability. Although the need to study the transuranic contamination potential and the addition of a separate tower for re-feed of tower ash were identified by the Oak Ridge review, neither activity was

implemented. The presence of transuranic contamination in feed material was not adequately considered in the design or operation of the oxide conversion process.

Although the tower room typically contained the highest radiation and contamination levels, most operations and maintenance exposures did not occur in the tower room. Primary activities resulting in exposures in excess of PALs included handling of oxide powders in preparation for feeding to the towers, changing the tower feed screw, connecting and disconnecting pigtails, and performing maintenance on cold traps plugged with foreign materials.

A handwritten report entitled; "Oxide Conversion as Viewed by Development" was written by a member of the Development Department (circa 1966), in response to a significant error in the uranium mass balance in the X-705E. The report explained that the oxide conversion process was originally established as a waste recovery process and not a production process. The subsequent introduction of reactor returns converted the X-705E into a production facility, requiring a capacity that "it was ill equipped to handle." The report further explains that uranium inventory control and health physics concerns were secondary to production schedules and costs, until "eventually the inevitable happened." The author's reference to "the inevitable" was directed primarily at the uranium inventory problem, but also refers to health physics problems. This report provides evidence that the operating contractor was aware of safety problems in the X-705E; however, production schedules were viewed as more important. The report also refers to the practice of "de-smoking ash pots through the building ventilation system" as a possibility for physical losses of small quantities of uranium. Since the building ventilation system was unfiltered and reactor return materials had been processed, transuranics from the ash pots likely entered the building ventilation system and were subsequently released to the environment but not monitored.

A 1976 memorandum (Memo GAT-922-76-184) identified transuranics as a problem at PORTS, especially in the oxide conversion process. PORTS had an existing inventory of transuranic-contaminated feed materials for oxide conversion and wanted to process that material. Based on recommendations from Oak Ridge, Goodyear Atomic Corporation performed a variety of process improvements and test runs to model fluorination of transuranics and reduce system leaks and contamination. On September 13, 1978, Health Physics management determined that those efforts were not sufficient and recommended shutting down the X-705E due to unacceptable health risks. On October 1, 1978, the oxide conversion facility was placed in a standby status; then on December 14, 1978, Goodyear Atomic Corporation requested cancellation of the oxide conversion project.

It appears that during its entire operation, the oxide conversion process placed Plant personnel working in the area, as well as security guards who may have been on patrol, at risk of exposure to chemicals and airborne radioactivity. Processing of transuranic-contaminated material was not adequately anticipated in the original or subsequent designs or operation. Samples obtained after shutdown showing the presence and level of transuranic contamination in the facility indicate that worker airborne exposures could have exceeded the acceptable standards, especially given the apparent lack of discipline in respirator use.

-from pages 45, 47, 49, 50

October 2, 1975 - INTERDEPARTMENTAL CORRESPONDENCE, GAT-242-75-121

Subject: TECHNETIUM IN X-705 EFFLUENTS

Need For Immediate Action

As we have discussed, the beta-gamma activity in the east drainage ditch has increased astronomically during September. The Chemical Analysis Department has identified the major source of this activity as beta radiation from technetium-99. The technetium activity in our Station 11 composite water samples¹ during 1975 are shown in Figure 1. Station 11 is located on the east drainage ditch immediately before it joins with Little Beaver Creek.

The weekly sample collected on September 29th showed a technetium activity of 67,600 d/m/100 ml (1.79 ppm Tc). This weekly-average value is 101.5 percent of the recommended concentration guideline² (RCG) for uncontrolled areas published in ERDAM 0524. It is also over 300,000 times the radiation limit specified by the State of Ohio (100 picocuries beta/liter). Note; however, that the State and ERDA standards are based upon instantaneous concentrations. I would guess that our peak Tc concentration is probably 20 times the average value. Therefore, we may exceed the ERDA standard by a factor of 20, and the State standard by a factor of 6 million.

The Ohio EPA has harried ERDA in the past about our radiological effluents exceeding state limits. In September alone, we have lost about 45 curies of technetium.

What Has Been Done

Studies by the Process Technology Department have shown that all of the technetium in the drainage ditch originates at the X-705. We are still not sure exactly how the technetium is entering the X-705, but obviously it is either contained in cylinder heels and/or the process equipment being decontaminated.

Even if we maintain the average-weekly concentration slightly below the RCG, our instantaneous Tc concentrations will still exceed both State and ERDA standards by a very wide margin.

March 10, 1994 - HEALTH PHYSICS OPERATIONS MEMO, OM-94-019

Subject: ALARA REVIEW OF AIRBORNE RADIOACTIVITY IN X-705 GREATER THAN ADMINISTRATIVE CONTROL LEVELS

Though this ALARA review was triggered by an isolated event ("H" area), this is the third instance of high levels of airborne contamination being spread into areas of the X-705 where routine work does not require respiratory protection this year. The adverse impact of this event

on "normal" facility operations is a symptom of a larger problem. The X-705 facility was not designed for its present throughput, or with present regulatory standards in mind.

Background

"H" area – On 2/28/94 through 3/2/94, the air samples drawn in the X-705 at the "GG", "GJ", "GO", and "GR" locations indicated alpha activity greater than the Administrative Control Level (ACL) requiring respiratory protection.

It appears the cause of the high airborne condition was the removal of existing ventilation duct work and subsequent clean up operations in the "H" area. Therefore, workers with routine access to these areas were probably exposed to airborne contaminant levels above the ACLs requiring respiratory protection for soluble uranium and radioactivity. Additionally, there was apparent spread of loose surface contamination outside the work area (H area). Ultimately, administrative controls must maintain radiation exposures ALARA. Present trends suggest that we are not meeting this goal.

April 21, 1994 - INTERDEPARTMENTAL CORRESPONDENCE

Subject: **POTENTIAL CIVIL PENALTIES FOR RADIATION PROTECTION PROBLEMS**

As requested, Dan Minter, Dave Simpson, and myself reviewed the documentation of the NRC action at the LaSalle County Station and compared the reports against recent events at Portsmouth. The incident at the LaSalle County Station can be summarized in two sets of statements.

- **The LaSalle County Station was cited by the NRC for:**
 1. Failure to perform an adequate evaluation of radiological hazards;
 2. Failure to use engineering controls to mitigate the creation of an airborne radioactivity area; and
 3. Failure to follow radiation protection procedures.

- **The NRC identified four programmatic weaknesses:**
 1. Management oversight was inadequate;
 2. Ineffective pre-job meeting;
 3. Poor worker and HP performance; and
 4. Ineffective long term corrective actions

The following conclusions were made:

1. Portsmouth has the same potential as LaSalle.

This statement is made based on the review of the X-705 ALARA review conducted in March 1994. The lack of engineering controls, pre-job meeting, and failure to recognize the potential

spread of contamination are parallel. The mitigating factor in our favor is the significantly lower specific activity of uranium compared to reactor corrosion and activation products. The lack of continuous air monitors and diffuse on pneumatic equipment is identical to LaSalle.

3. The enterprise has the potential for civil penalties for radiation protection.

A review was conducted of the past 12 months of compliance activity from "Nuclear News". The NRC has issued fines to the commercial power industry totalling over \$3.7 million in the past 12 months. They are fully staffed to win a court fight and have no reluctance to do so. With one exception, the fines are levied for operational performance and not documentation problems. (A \$15,000 fine was levied against one utility for insufficient analysis of a safety system design change.) Given the events and non-conformances of the past 9 months, we have the potential liability for civil penalties.

SUMMARY

In the haste to produce atomic bombs during the war, certain risks may have been taken in research, production, testing, transportation and waste disposal. We are now paying the price for these risks with environmental contamination at DOE sites over the entire country. Even more important is the effect on the workers' health at these DOE facilities. Many have fallen ill and/or passed away from being exposed to different types of radiation and radioactive contaminants introduced back into the systems.

Although AEC recognized the potential for transuranic contamination of the cascades, it was not until a 1965 appraisal that OR identified a potential problem with transuranics and fission products in the X-705E, and recommended studies to determine where these materials could concentrate in the process. Records reflect that PORTS then reviewed the potential problems posed by feeding reactor returns to the oxide conversion plant; however, detailed studies were not performed.

Dosimetry programs at PORTS from 1954 to 1992 were neither calibrated nor monitored for neutron exposures. A National Institute of Occupational Safety and Health (NIOSH) evaluation for PORTS studied the neutron radiation issue in 1957, and concluded that there was potential for chronic low-level neutron exposures in areas where uranium was stored (cylinder yards), handled (feed and withdrawal areas), or solidified within the cascade (deposits). In 1998, OSHA cited USEC for failing to preserve and maintain records of employee exposure of all employees for at least 30 years.

During the 1950s and 1960s, urine samples were typically analyzed for uranium, and in most cases for alpha activity. Typically, the sample collection procedure involved the collection of Monday morning urine specimens (the morning following two or more days off the job). This was non-conservative, and the collection date evolved to a "Friday" sample during the 1970s and 1980s. Considering that numerous routine analysis results reflected uranium intakes in the years of operation and the rate at which soluble uranium is excreted, some uranium intakes were likely not identified or properly investigated. Technetium analysis was not added until the 1970s.

Over its entire period of operation (1957-1978), the oxide conversion process was probably one of the most hazardous radiological and chemical operations at PORTS. A handwritten report entitled, "Oxide Conversion" as viewed by Development (CIRCA 1966) in response to a significant error in the uranium mass balance in the X-705E, explained that the oxide conversion process was originally established as a waste recovery process and not a recovery process. The subsequent introduction of reactor returns converted the X-705E into a production facility requiring a capacity that "it was ill equipped to handle". The report further explains that uranium inventory control and health physics concerns were secondary to production schedules and costs. On September 13, 1978, Health Physics management recommended shutting down the X-705E due to unacceptable health risks. On December 14, 1978, Goodyear Atomic Corporation requested cancellation of the oxide conversion project.

Worker safety and health programs were established when the plant started operation and have evolved significantly. The implementation and effectiveness of these programs varied widely, and in many ways, failed to adequately protect the safety and health of PORTS workers. It was not until the 1990s that a more focused and rigorous ES&H training program was established.

Staffing for all safety and health organizations was very limited well into the 1970s and was insufficient to provide adequate attention for up to 2500 employees working in numerous and varied hazardous conditions.

Records of radiation and contamination surveys were readily available from the start of plant operation. Survey records for all major buildings indicate contamination levels above limits over many years. Recommendations for decontamination of locations exceeding PALs were typically made and noted by Industrial Hygiene and Health Physics personnel on the survey forms. In some cases, follow-up surveys noted that areas continued to be contaminated above limits, with continued recommendations for decontamination. However, rigorous enforcement of decontamination requirements was not evident.

Environmental practices prior to Federal and State legislation in the 1970s and 1980s resulted in many adverse impacts to the environment, although essentially all on Federal property. AEC/ERDA/DOE and contractors failed to proactively identify ES&H vulnerabilities, clearly communicate high expectations for ES&H performance, and implement consistent, effective corrective actions to known problems. Management also failed to ensure that hazard controls were implemented by supervisors and workers, resulting in additional and higher exposures to personnel and continuing unnecessary radioactive contamination.

In the 1980s, OR ES&H Oversight became more rigorous and proactive, especially after the Tiger Team assessment in 1989 identified significant programmatic deficiencies and unsafe conditions and performances at the plant.

CONCLUSION

AEC/ERDA/DOE's priority has always been production. Production was primary and nuclear safety secondary. As a result of this approach, we now have DOE facilities all over the country that are contaminated. (Linking Legacies – January 1997 Connecting the Cold War Nuclear Weapons Production Processes to Their Environmental Consequences)

Nuclear workers (cold war veterans) were put in harms way as a result of this approach. In October of 2000, the EEOICPA was passed by Congress and signed by the President to compensate nuclear workers made ill by exposure to radiation. For those workers not covered under Special Exposure Cohort, NIOSH will do dose reconstruction to determine if illness or death was 50% or more likely caused by radiation exposure.

The problems arise with the method(s) NIOSH will use to perform their dose reconstruction. (Examples: urine monitoring data, dosimetry data, etc.) This data is suspect at best in NIOSH's own words. "Final Report July 2001", page 73, "In an earlier study, NIOSH evaluated the urine monitoring data, but reasoned that the mass uranium data had not been collected in a way that allowed back calculation to actual exposure."

The dosimetry program has had problems over the years. Badges not calibrated for neutron exposure and zeroing of badges. NIOSH "Final Report July 2001, page 85"

- 4) Historically, control dosimeters were positioned in areas of elevated background radiation which resulted in artificially low recordable doses.
- 2) Monitoring results below the limit of detection should also report that limit of detection. Recording results as zero and "less-than" an exposure or dose limit should be avoided. (page 86)

Even if this process is practical, we still will not have the true picture. Without chronic exposure factored into the equation, the worker will be short-changed.

An analogy would be the reconstruction of an old vehicle. When restoration is completed, the outside and inside may look good, but when the key is turned, nothing happens. The hood is lifted and the engine is missing. Chronic exposure is the missing engine with dose reconstruction. Chronic exposure cannot be reconstructed. The building(s) the employee worked in and radiation exposure in these buildings would have to be factored as a percentage in the total reconstruction process.

The present dose reconstruction process is designed for failure. The ultimate results will be a legal quagmire, individual lawsuits, class action lawsuits, etc.

In the final analysis, NIOSH's dose reconstruction failure may make DOE's failure with Subtitle D (physician's panel) look tame in comparison.