*U.S. Department of Energy, Office of the Press Secretary, Washington, DC20585*

# Declassification of the Quantity of Enriched Lithium Produced at the Y-12Plant in OakRidge, Tennessee

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The Department of Energy has declassified information on the quantity oflithium that was enriched in the isotope lithium-6 at the Y-12 Plant inOak Ridge, Tennessee, and the total amount of depleted lithium, storedin the form of lithium hydroxide, at the Portsmouth Gaseous DiffusionPlant in Portsmouth, Ohio.

## Specifically

- The United States produced a total of 442.4 metric tons ofenriched lithium from 1954 to 1963 for thermonuclear weapons, tritiumproduction, and other purposes. The yearly production of the enrichedlithium is shown on the attached chart.

30,909 metric tons of depleted lithium hydroxide monohydrate(process tails) are stored at the Portsmouth Gaseous Diffusion Plant,and 10,455 metric tons of natural unused lithium hydroxide monohydrateare stored at the K-25 Site.

- 12 metric tons of natural and 8 metric tons of depleted lithiumhydroxide monohydrate are stored at the Y-12 Plant.

## Background

- Almost all lithium produced by the United States was enriched bythe Column Exchange process. The Column Exchange facilities ran from1955 to 1961 producing lithium-6. Enrichment starts with naturallithium that contains about 7.5 percent lithium-6, with the remainderlithium-7. Lithium-6 is the desired product. It was removed fromnatural lithium and concentrated in the enrichment process to either95.5 percent, 60 percent, or 40 percent lithium-6, leaving depletedlithium which contains only 1 to 4 percent lithium-6.
- The Y-12 Plant produced enriched lithium-6 for thermonuclearweapons, tritium production, and other purposes. Some lithium-7 wasproduced to support the Department of Energy's nuclear reactor research.Lithium-7 hydroxide is a chemical base that is used to adjust theacidity of water in a reactor, since it does not absorb many neutrons orform a long lived activation product.
- Almost all lithium produced by the United States was enriched bythe mercury-based Column Exchange process. In the process, lithiumhydroxide was exchanged with lithium amalgam. Lithium-6 wasconcentrated in the amalgam phase.
- A small amount of lithium was enriched by the Electro-Exchangeprocess, an electrochemical process that also used a large amount ofmercury. The Electro-Exchange Plant was operated from 1953 to 1956.
- The quantity listed here is based on the evaluation of the recordsavailable. The quantity may be updated or revised in the future afterre-evaluation of the methodology used originally.

## Benefits

- As part of the Secretary of Energy's Openness Initiative, theDepartment of Energy is declassifying information regarding the amountsof enriched lithium produced at the Y-12 Plant in Oak Ridge and thetotal amount of depleted lithium at the Portsmouth Gaseous DiffusionPlant in Portsmouth, Ohio. As a result of this declassification, theAmerican public will have information that is important to the currentdebate over proper management and ultimate disposition of materials.The release of this information should encourage other nations todeclassify similar information.
- Declassification will facilitate the environmental restoration ofthe shutdown Column Exchange Plant by allowing more of its equipment tobe disposed of as unclassified hardware.
- Declassification of lithium-6 production will permit explicitincorporation of significantly more data by the State of Tennessee inthe environmental radiation dose reconstruction study for exposure tomercury used in

lithium enrichment.

## Who Are the Key Stakeholders?

- *Regulators.* The State of Tennessee has oversight of offsitereleases of mercury and storage of lithium hydroxide at Oak Ridge. TheState of Ohio regulates lithium hydroxide storage at the PortsmouthGaseous Diffusion Plant. Declassification permits public discussion ofrelated activities.
- *The Public.* The public will be able to discuss issues related tolithium production on a more knowledgeable basis, and will be providedwith access to more specific information on mercury handling than waspreviously possible.
- *Public Interest Organizations.* Stakeholders includeenvironmental, safety and health groups, historians, archivists,researchers, scientists and industrial workers, as well as State andFederal personnel. With this declassification, those interested inoversight of lithium-related activities will have additional informationregarding the quantity of enriched lithium produced at the Y-12 Plant inOak Ridge, Tennessee, and the total amount of depleted lithium stored atthe Portsmouth Gaseous Diffusion Plant in Plymouth, Ohio. Publicinterest organizations which have expressed such an interest include(but are not limited to): Citizens for Better Health; Energy ResearchFoundation; Environmental Information Network; Foundation for GlobalFriends of the Earth; Greenpeace; League of Women Voters; MilitaryProduction Network; National Security Archive; Natural Resources DefenseCouncil; Oak Ridge Education Project; Physicians for SocialResponsibility; and the Sierra Club.
- *Freedom of Information Act Requesters.* There have been Freedom ofInformation Act requests for related information in the past. Futurerequesters can be provided more complete answers.

### Contact

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# Attachment

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# QUESTIONS AND ANSWERS

Q. Why is lithium production being declassified if it is used inthermonuclear weapons?

A. Our review indicates that lithium production can be declassifiedsince it is produced in excess. Therefore, the information does notprovide correlation with the number of weapons using this material. Quantities of lithium used in nuclear weapons are still classified.

Q. Does the storage and use of chemicals, such as lithium, and therelease of radioactive materials, such as uranium, at the Y-12 Plantrepresent a health hazard to the workers or the public?

A. The Department of Energy is addressing the question of healthhazards from exposures to chemicals and radioactive materials bysponsoring a comprehensive package of health studies of Oak Ridgeworkers and community residents.

The medical surveillance program examines workers exposed to chemicalsand radioactive materials to identify signs of organ damage known to beassociated with metals, such as beryllium, mercury and uranium. TheNational Institute for Occupational Safety and Health is managing aspecial study of mercury workers.

The Department of Energy has established a special medical monitoringprogram for beryllium workers at the Oak Ridge Y-12 Plant. In 1991, twoberyllium workers who had been diagnosed with other lung diseases weredetermined to have chronic beryllium disease. In 1993, 146 currentberyllium workers were provided a the blood lymphocyte proliferationtest for immunologic sensitivity to beryllium. Six cases of chronicberyllium disease were diagnosed among those with abnormal blood testresults. In 1994, 383 former beryllium workers have been provided theblood test, 12 have been found to be abnormal, and 1 case of chronicberyllium disease has been diagnosed. One individual with an abnormalblood test was found not to have chronic beryllium disease and 10 othersare scheduled for or in the process of receiving diagnostic medicalexaminations.

The Department of Energy conducted mortality studies of workers atvarious facilities on the Oak Ridge reservation. The studies includedindustrial exposures to nonradioactive chemicals such as elementalmercury, and to ionizing radiation primarily through exposure touranium. A mortality study of 2,133 white male workers exposed toelemental mercury at Y-12 and an unexposed group was published in 1984. The mercury exposed workers did not have any statistically significantcauses of death, whereas the control group exhibited two cancercategories with more deaths than expected. In a related study, a groupof 247 workers heavily exposed to elemental mercury and a control groupwere studied for clinical evidence of mercury toxicity. The results ofthis study, published in 1988, determined that the mercury workers hadfew clinically significant abnormalities except for the increasedprevalence of tremor. The Oak Ridge Institute for Science and Educationand Emory University are updating this study under a contract with theNational Institute for Occupational Safety and Health.

A Y-12 mortality study, published in 1981, included 18,869 white malesemployed for more than 2 days between June 1943 and May 1947. Nopersonnel dosimetry data was available, although radiation exposure wasprimarily due to uranium dust. The vital status of the workers wasfollowed through 1973. The elevated risk of lung cancer wasstatistically significant among men hired at age 45 or older and exposedto

uranium dust. Employees in this cohort who were exposed to phosgenewere also the subjects of two separate mortality studies published in1980 and 1985. Exposure to phosgene is associated with increased deathsdue to lung diseases, including lung cancer, but there was no observedexcess of lung cancer and only a slight increase in respiratory diseasemortality through 1985. A special study of 27 cases of central nervoussystem cancers among Y-12 workers was published in 1987. No associationbetween the risk of these tumors and internal exposure (using the lungdose from uranium as the surrogate for brain dose) or external radiationwas found.

A mortality study of 6,781 white males employed at Y-12 for at least 30days between 1947 and 1974 was published in 1988. This study examinedthe mortality of workers exposed to ionizing radiation from uraniumcompounds. The death rate for lung cancer was statisticallysignificantly elevated when compared with U.S. death rates. There wasevidence that the risk of lung cancer increased with increasing exposureto ionizing radiation. There was no excess rate of death among workerswhen compared with Tennessee death rates. This study has been updatedthrough 1990 and the report is expected in 1994 after review by theNational Institute for Occupational Safety and Health who currentlymanage Department of Energy analytic epidemiology studies.

Y-12 workers are also part of other Oak Ridge studies in progress thatfocus on statistical methodology rather than risk of disease.

A mortality study of the Oak Ridge workers was published in 1985. Thevital status of 8375 white males who worked at least 1 month between1943 and 1972 at Oak Ridge National Laboratory was followed. This studyincluded mortality through 1977. Statistically significant decreases ofcancer deaths were noted for 6 of the 23 categories of cause of deathand none had statistically significant increases. Deaths due toleukemia, Hodgkin's disease, and prostate cancer were slightly elevated. Leukemia death rates were highest among men employed 10 or more years orinvolved in engineering activities.

A second study of the Oak Ridge National Laboratory cohort was publishedin 1991. The study found a statistically significant excess death ratefrom all leukemia combined although there was no correlation with theamount of ionizing radiation encountered in the workplace. The overallcancer death rate increased with increasing exposure to ionizingradiation. The statistical tables in the 1991 publication were inerror, but the conclusions remained unchanged. In 1992 a secondpublication analyzed associations between cancer mortality andoccupation. The author concluded that isotope production, chemicaloperations and exposures to mercury, beryllium and lead may beassociated with higher cancer risks. The vital status of the workersincluded in the Oak Ridge National Laboratory study is expected to beupdated through 1990.

The results of these studies were published and the information wasprovided to workers.

A community dose reconstruction study to estimate chemical and radiationdoses to community residents is being initiated this year by the Stateof Tennessee under a State Health Agreement. It will assess releases ofmaterials to the environment and the pathways leading to human exposure.

The State Health Agreement also supports quality assurance activities toenhance the operations of the Tennessee cancer registration program. The registration of cancer cases in a surveillance system will helpdetect unusual patterns or clusters of cancer in workers or residentsliving near the site. The clusters can then be examined for potentialassociations with Site operations or releases.

The State Health Agreement supports a birth defects registry inTennessee. The registry provides

information about any reproductiveoutcomes so that those can be analyzed to determine if they areassociated with the Department of Energy operations in Tennessee.

The following information is a summary of bioassay (medicalsurveillance) programs at the Oak Ridge National Laboratory facilities:

### Workers at the Oak Ridge Y-12 Plant

During calendar year 1993, 1978 workers at Y-12 were monitored forpotential exposure to uranium. The number of positive doses in thatgroup was 687. Five hundred and seventy-two of these represented dosesbetween 1-10 mrem committed effective dose equivalent. Committedeffective dose equivalent is the dose that the individual will receivefrom the uptake that is delivered to body tissue over the next 50 years. Ninety-three doses fell within the range of 10-30 mrem committedeffective dose equivalent. Eighteen doses fell within the range of31-100 mrem committed effective dose equivalent. One dose fell withinthe range of 101-150 mrem committed effective dose equivalent and thehighest was in the range of 201-250 mrem committed effective doseequivalent. There was no reported exposure to either plutonium ortritium. The majority of the doses at Y-12 are chronic exposures. Thus, there is little distinction between historical and currentexposures.

### Workers at Oak Ridge National Laboratory (X-10)

During calendar year 1993 1245 personnel were monitored at the Oak RidgeNational Laboratory (X-10) for potential internal dose. Of these about95 percent were monitored for plutonium, Tritium or uranium. There wereno positive plutonium doses. Two positive Tritium doses ranged from 1-2mrem committed effective dose equivalent. Seven positive uranium dosesranged from 2-66 mrem committed effective dose equivalent.

Historical burdens are being followed for 3 individuals for plutonium, 2for uranium and none for tritium.

### Workers at the Oak Ridge K-25 Plant

During calendar year 1993, 1339 individuals were monitored (all foruranium). The number of individuals with positive uranium doses was 64. The range of the uranium uptakes was 1-16 mrem committed effective doseequivalent. This range could change as 14 of these dose assignments areunder current analyses update.

Q. What kind of data will you be able to supply for environmental dosereconstructions that you were unable to supply in the past?

A. The State and its contractors already have access to relevantclassified data. The declassification process that was initiated willpermit more information to be provided to the public. Plant capacitieshave been declassified so that quantities of mercury in some parts ofthe plant or equipment would be declassified.

Q. What is depleted lithium hydroxide, and why is it stored atPortsmouth?

A. The material at Portsmouth is depleted in lithium-6. Depletedmaterials contain less lithium-6 than naturally occurring lithium, whichcontains 7.5 percent lithium-6. The depleted materials contain between1 and 4 percent lithium-6. The material was stored at Portsmouthbecause warehouse capacity was available.

Q. Why did you only run the Column Exchange Plant for 8 years?

A. The plant produced all the lithium-6 that we needed in thattimeframe. It was later used to make lithium-7 of high isotopic purityfrom depleted lithium.

Q. What are plans for disposition of the lithium hydroxide atPortsmouth and Oak Ridge? Is it waste?

A. The lithium hydroxide at both Portsmouth and Oak Ridge will bedisposed of by a negotiated sale to major lithium producers. Lithiumhydroxide is not considered a waste by the Department.

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