FP 710-1

DOCKET NUMBER PR-30, 32, 70, 150
PROPOSED RULE (45 FR 70874)
SMELTED ALLOYS

(3346)

Department of Energy
Washington, D.C. 20585

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DOCKETED USNRC
FEB 27 1981
Office of the Secretary
Docketing & Service
Branch

Mr. Samuel J. Chilk
Secretary of the Commission
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attn: Docketing and Service Branch

Dear Mr. Chilk:

Please refer to Federal Register, Volume 45, No. 209, Monday, October 27, 1980, on proposed amendment to 10 CFR Parts 30, 32, 70, and 150 relating to "Exemption of Technetium-99 and Low-Enriched Uranium as Residual Contamination in Smelted Alloys." It is recognized that the comment period identified in the Federal Register expired on December 11, 1980; however, it is understood that comments submitted beyond that time limit will be considered in Commission rulemaking.

The Department of Energy strongly supports the intent of the proposed rule change, since it can ultimately result in reduction of the huge inventories of contaminated Department of Energy scrap metals being generated, and now in surface storage, without endangering the environment or public health and safety. These metals have economic recovery value, and some, such as stainless steel and nickel, contain materials of strategic importance to the Nation. Without the proposed regulations, much of the Department's inventory would eventually have to be disposed of as waste.

The Department of Energy also urges the Nuclear Regulatory Commission to reconsider the upper limit of 20 percent imposed on the enrichment of the residual uranium contamination in order to qualify for exemption under the proposed regulation. As long as the residual concentration limits of 17.5 ppm total uranium or 3.5 ppm U-235 can be met, we question the need for such a restriction. If this upper limit could be modified, then a larger inventory of scrap metal from the Department of Energy could be dealt with.

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Additional detailed comments are enc...ed. A reply regarding the disposition of Department of Energy comments will be appreciated. If the Commission staff woul' like to discuss the Department of Energy comments, please contact E. Redden (353-3548) of my staff.

Sincerely,

Alex G. Fremling
Acting Assistant Secretary
for Environment

Enclosures:
1. Consolidated comments on Proposed Rule: "Exemption of Technetium-99 and Low-Enriched Uranium and Residual Contamination in Smelted Alloys"
2. Extracts and Comments from NUREG-0518

CONSOLIDATED COMMENTS ON PROPOSED RULE:
"EXEMPTION OF TECHNETIUM-99 AND LOW ENRICHED URANIUM
AND RESIDUAL CONTAMINATION IN SMELTED ALLOYS"

1. The key concentration as set forth in both 10 CFR 40.13 and the proposed 10 CFR 30.21 is 3.5 ppm U-235. If metals contaminated with the high-enriched uranium can be smelted such that the U-235 concentration does not exceed this limit or the total uranium concentration does not exceed 17.5 ppm, why is there a 20 percent limit on enrichment?

   There is a considerable volume of scrap metal contaminated with small amounts of high-enriched uranium from fuel fabrication activities. Currently, this material must either be buried as radioactive waste or laboriously decontaminated. Most of this scrap material could be smelted to produce an alloy containing less than 3.5 ppm high-enriched uranium. The radiological impact of exempting smelted alloys containing less than 3.5 ppm high-enriched uranium would be no greater than the impact of exempting alloys with 17.5 ppm of 20 percent enriched uranium. Similarly, this lower limit of 3.5 ppm of high-enriched uranium would be at least as difficult to recover as the 17.5 ppm limit which the NRC stated was practically irrecoverable.

   We propose that NRC delete the enrichment limit.

2. Would the slag produced by licensed smelters be subject to specific licensing and regulatory controls under 10 CFR 61 as well as under 10 CFR 30 and 10 CFR 70 as specified?

3. According to NUREG/CR-0134, the population dose from smelting of all current scrap (42,000 Mg) would be at least 30 times the value quoted in the proposed rule. Other doses that are quoted are reasonable (within a factor of 2-3). Perhaps the larger population dose is due to the inclusion of product distributors and users as members of the general public. The present environmental impact statement should incorporate information from NUREG/CR-0134.

4. NRC should develop exemption requirements for at least three other, somewhat arbitrary, classes of contaminated metal scrap: fission product/non-TRU, very low TRU (i.e., much less than 10 nCi/g), and metals containing induced activity. Indeed, there should be de minimus quantities for metal scrap contaminated with <u>any</u> radionuclide. What is the applicability of the exempt concentrations listed in 10 CFR 30.70, Schedule A, Column II to smelted metals? We are not suggesting that this be made part of the present proposed regulations, but that this should be made a high priority for future NRC work.

5. If the letter of the law is followed, this rule change may still not allow the sale of smelted gaseous diffusion plant upgrading (CIP/CUP) scrap (and perhaps no other scrap) due to the statement that the proposed rule change is only for technetium-99 and low-enriched uranium as residual contamination. For example, Pu and Np were

treated in the draft environmental impact assessment prepared several years ago, but were dropped completely from the final statement prepared by NRC (except for a statement at the bottom of page 2-1 that recognizes the Pu and Np but states that it will be reduced to such an extent that the metal can be recycled in an uncontrolled manner). Pu and Np are in the smelted CIP/CUP scrap at the $< 1$ ppb level.

There appear to be several approaches which could be taken with regard to tne Pu and Np content of the CIP/CUP scrap:

A. Assume that an official de minimus quantity of 1 ppb Pu and Np is intended.

B. Generate a separate rule change to add de minimus quantities of Pu and Np (see item 4 above).

C. Prepare a sampling plan which includes analysis to a minimum level of Pu and Np (e.g., 5 ppb); anything below this could be assumed to be negligible. Such a plan is required of commercial smelters for approval by NRC. For DOE smelters, the sampling plan should only require DOE approval to certify the material as meeting the proposed rules.

D. Ask for a specific exemption to 10 CFR Part 70 as is provided for in Part 70.14 to allow resale of the 1 ppb Np and Pu in smelted CIP/CUP scrap.

6. The dose estimation methods, assumptions, and dose estimates given in the Draft Environmental Statement (DES), NUREG-0518, are similar to, and in substantial agreement with, those in the 1976 Environmental Impact Assessment (EIA). In fact, the DES draws heavily on the EIA. Both reports indicate that low doses are to be expected. The DES apparently gives higher doses than were given in the EIA. Also:

A. The DES reworks the assumptions and scenarios from the EIA to produce new dose estimates. The extent of rework is not always clear. If the DES is to be rewritten (vs. merely copying) to produce the Final Environmental Statement, the differences between the DES and the EIA assumptions and scenarios should be indicated explicitly. The DES cites the EIA as the basis for many of its assumptions and scenarios.

B. There may be errors in some of the reported dose rate estimates. A spot check of Table 4.10 revealed an error. Based on the information presented, the population dose rate to "Carriers-Men" should be 2E-3 person-rem/year, not 2 as indicated. This would change the total population dose rate to 0.1 person-rem/year instead of 2. This would also change values for use of pennies and, possibly, nickels that are given in other tables (e.g., Tables 4.11 and 4.15).

7. Several surface decontamination techniques (such as electropolishing) were briefly described in Section 2.2 of the Draft Environmental Statement; however, there was little discussion of the types of materials where smelting is preferred over surface decontamination. As a general radiological control policy, decontamination of surfaces, where practical, is suggested before deciding to dilute the contamination in the matrix. We do not suggest that this should be made a requirement preparatory to smelting, but the Environmental Statement should include a more complete discussion of the costs and benefits, as well as disadvantages, of surface decontamination as opposed to smelting.

## COMMENTS ON PROPOSED DE MINIMUS DRAFT EIS (NUREG-0518)

Attached are several pages from the above document. Comments are discussed below.

### Section 1.1

In discussing the proposed action, it should be noted that the limits on uranium contamination being sought are already in compliance with 10 CFR Part 40 regarding fissile uranium. Acceptance of the rule change would not increase the levels of U-235 in materials released to the public sector.

In the fifth and sixth paragraphs, it appears that NRC would require UCC-ND and the FMPC at Fernald, Ohio, to obtain licenses pending approval of operating and sampling plans. Since these plants operate as DOE facilities, they should be exempt from NRC licensing. DOE is capable of reviewing operating procedures and sampling plans and can withhold approval if they are deficient. If these paragraphs refer to processing by a commercial operator, such licensing would be redundant, since an outside contractor would first have to obtain licensing based on his intent to handle the contaminated scrap. Operating procedures and sampling plans would have to be included as part of the initial licensing request.

### Section 2.1.1

The second paragraph in this section erroneously gives 1 ppb as the levels of plutonium and neptunium contamination of the scrap. The sentence should be appended as noted in the text, indicating these are the contamination levels after slagging.

### Section 2.1.5

It should be noted that contamination levels on the type of scrap being discussed are already covered under 10 CFR Part 40 concerning natural uranium contamination. Why is there a limit on enrichment if the contamination limits can be met?

### Section 2.3.4

This section discusses aluminum smelting. While the discussion is academic to the intent of the document, the indication that none of the CIP/CUP scrap aluminum could be smelted and sold in conformance with the proposed exemptions is misleading. This could have a future negative impact. In fact, by incorporating current smelting technology, and through segregation and blending, a significant quantity of the diffusion plant aluminum could be processed and sold as ingots containing less than 17.5 ppm U and less than 5 ppm Tc.

Section 3.3.2.4

In Table 3.10 on raw steel production, the production total and percentages are not in agreement. In checking the reference, the discrepancy appears to be in the conversion of thousands of tons to megagrams (Mg). The percentages are correct, but the Mg values should be changed as noted.

Section 6.1.3

It should be noted that shallow land burial is permitted under current regulations, but that more restrictive guidelines may be imposed in the future both at the State and Federal levels. Burial as hazardous waste would double the cost and reduce the number of suitable burial sites due to more stringent criteria.

Section 6.1.4

On Page 606, it is stated that noncontaminated, smelted nickel ingots are stored at the PGDP. We have been selling these ingots as they have been produced.

Section 6.2.3

In the fifteenth paragraph following proposal of 5 ppm Tc level, restate the findings of "negligible impact" at this level from Section 4. Otherwise, it reads as a purely technical decision based on smelting.

In the Federal Register, under "Basis for Technetium-99 Limit," Page 70876, and in NUREG-0518, Page 6-9, the following statement is made:

> "In the case of scrap metal generated in the Cascade Improvement program and Cascade Upgrading Program, the combination of feed material specification, deposition rates, and mechanical and chemical decontamination results in scrap metal contaminated with a maximum of 5 parts per million technetium-99."

This statement is incorrect. The phrase "maximum of 5 ppm...." should be changed to "average of less than 5 ppm..."

Technetium levels of up to 60 ppm on a small quantity of scrap CIP/CUP barrier have been monitored. The overall average concentration, however, is 4.7 ppm. Through decontamination, segregation, blending, and analytical monitoring, all ingots sold will contain less than 5 ppm of technetium. Without blending, it is not always possible to achieve a level of 5 ppm prior to smelting. Thus, though the statement is technically incorrect, the de minimus guideline would not be violated, and the proposed Section 30.21 is applicable.

Section 7.4.2.1

The second column of Table 7.5 (pg. 7-6), referenced in this section, under the heading of "Quantity of Copper" should be in "Mg" rather than "$m^3$".

Miscellaneous

The values given for 50-year contact bone dose given in Tables 1.1 and 4.12 are inconsistent.

The discussion of Economic Benefits and Costs in Section 7 should be revised and updated to 1980.

*Extracts from NUREG-0518 - Comments and suggested changes are given in italics*

# 1. SUMMARY

## 1.1 THE PROPOSED ACTION

By memorandum dated February 12, 1974, to the Director of Regulatory Standards, AEC, the Director of Waste Management and Transportation, AEC, requested assistance in establishing a de minimis quantity of enriched uranium in 10 CFR Part 70.(1)

In a response dated March 28, 1974, the Director of Regulatory Standards agreed to consider an amendment of 10 CFR Part 70 to establish a de minimis quantity for enriched uranium in scrap metal.(2)

In an additional letter dated July 9, 1979, the Director of the Office of Uranium Resources and Enrichment, DOE requested from the Executive Director of Operations, NRC a prompt approval of the aforementioned amendment to 10 CFR Part 70.(3)

The proposed action is the adoption of regulations that would exempt from the Commission's requirements for a license any person to the extent that such person receives, possesses, uses, or transfers Tc-99 or low-enriched uranium as residual contamination in any smelted alloy.

The exemptions would be subject to the following terms and conditions:

- Persons who smelt scrap contaminated with Tc-99 or low-enriched uranium or persons who initially transfer for sale or distribution smelted alloys containing Tc-99 or low-enriched uranium as residual contamination in the smelted alloys would not be exempt from requirements for a specific license.
- The Tc-99 and the low-enriched uranium would be minor constituents less than 5 parts per million and 17.5 parts per million, respectively, of representative samples of the smelted alloys.

*Comment Note 1* The proposed action would also provide specific requirements for licenses to smelt scrap or to initially transfer for sale or distribution smelted scrap for use under the exemptions. Applicants will be required to submit a description of procedures for prior decontamination of the scrap, smelting of the scrap, sampling of the resulting smelted alloys, and the analyses of representative samples for Tc-99 and low-enriched uranium concentrations.

The potential environmental impacts of the distribution, use, and disposal of smelted alloys containing Tc-99 or low-enriched uranium as residual contamination are assessed in this statement. *[add Note 2]*

*Comment Note 1:* *This should not apply to DOE facilities, and it is redundant if applied to commercial operators.*

*Add Note 2:* *It should be noted that at the 17.5 ppm level, the maximum fissile content of low-enriched uranium is 3.5 ppm which is equivalent to, and in compliance with, the allowable fissile uranium content of material contaminated with natural uranium current exempt from licensing under 10 CFR 40.*

# 2. SMELTED ALLOY CONTAINING RESIDUAL LOW-ENRICHED URANIUM AND TECHNETIUM-99

## 2.1 DESCRIPTION OF GENERATED SCRAP

Scrap metal of various radioactive contamination levels has been, is being, and will be generated by the nuclear industry from both government and commercial segments. The metal comes from various sources including the upgrading of equipment, replacement of inoperative or damaged equipment, and the dismantling of obsolete or worn-out facilities.

Presently a large amount of scrap metal contaminated with low-enriched uranium and Tc-99 is being generated by the Cascade Improvement and Cascade Uprating Programs (CIP/CUP) for the Department of Energy (DOE) gaseous diffusion plants.

Other contaminated scrap from previous DOE (AEC-ERDA) operations is located at other locations around the country; a large portion of this scrap resides at the Nevada Test Site. Much of this latter scrap is of undetermined contamination level.

Presently, relatively small amounts of contaminated scrap metals are generated by commercial nuclear facilities; however, in the future a large amount of scrap metal of varying degrees of contamination will become available when the presently operating power reactors and fuels reprocessing plants are dismantled at the end of their useful life (approximately 30 to 40 years). A large portion of this scrap metal could be recycled back into commercial usage through economical and reliable decontamination methods.

Since data on the quantity, classifications, and contamination levels of the other DOE and commercial scrap are unavailable at the present time the cost/benefit portion of this environmental statement will consider only the scrap generated by the CIP/CUP program of the DOE diffusion plants.

### 2.1.1 Scrap metal from Department of Energy sources

Presently metal scrap contaminated with radioactivity to various degrees has been and is being generated by the many programs sponsored by the DOE. A particular source of scrap contaminated with a relatively low level of radioactivity is that generated by the CIP/CUP programs.

These programs for upgrading the gaseous diffusion plants located at Portsmouth, Ohio; Paducah, Kentucky; and Oak Ridge, Tennessee have generated large quantities of scrap metal such as steel, copper, nickel, and aluminum. This scrap is contaminated with small quantities of uranium and Tc-99 with only minute quantities of neptunium-237 and plutonium at concentrations less than 1 part per billion (ppb). Smelting this scrap will reduce the contamination to such an extent that the resulting metal alloy may be recycled as uncontrolled metal to the marketplace.

*are present after smelting.*

### 2.1.3 Fuels reprocessing plant

In reprocessing plants the overall contamination level of most salvageable metals would be high for most sections of the plant. It is presumed that recovery of most of these metals would not be feasible. Scrap of relative low contamination levels which could be recovered is not a large segment of the total scrap generated during decommissioning of such a facility. The following table indicates approximate amounts of "low-level" scrap* generated.(8)

| Types of Scrap | Quantity/Plant (Mg) |
|---|---|
| Stainless Steel | 50 |
| Equipment and Piping (steel) | 400 |

### 2.1.4 Fuels fabrication plants

The quantity of scrap from fuel fabrication plants would, in all probability, be small and would not contribute large quantities of low-level contaminated scrap compared to that expected from reactors and fuels reprocessing plants. These other sources taken into entirety are sufficiently small that it is reasonable to assume that any additional impacts would not significantly affect the already small impact.

### 2.1.5 Other sources of scrap

There are miscellaneous sources of low-level contaminated scrap such as mining and milling operations. These sources too, would contribute only small amounts of scrap to the total available from reactors and fuels reprocessing plants. However, to the extent that these sources never see low-enriched uranium, they ~~cannot generate scrap covered by this proposed action.~~
*will not be considered here as they are presently regulated under 10 CFR 40.*

## 2.2 DECONTAMINATION

Decontamination is the process whereby the quantity of radionuclides adhering to the surface or included within a material is reduced.

A number of factors affect the decontamination of metals. The type of metal, its surface finish and the physical, chemical and radiochemical nature of the contamination. The majority of contaminants are metallic and exhibit characteristics that are quite similar to the contaminated substrate. Because of

*The term low-level, when pertaining to radionuclide concentrations has many definitions in the industry. Here "low-level" scrap is defined as that scrap, which could be decontaminated and smelted to meet the levels of contamination stipulated in this environmental statement.

used nickel barriers from the diffusion plants into new devices, thus recycling the material.[3] However, because of the unfavorable economics of the process the plant is not in operation and is now being dismantled.

### 6.1.3 Burial of contaminated scrap

Materials only slightly contaminated with radioactivity are presently considered low-level waste. These wastes may be buried a few feet below the ground surface (in trenches 200 to 300 m long, 15 m wide and 8 m deep) within special restricted areas called shallow land burial facilities. These sites are restricted to unauthorized intrusion by an 8-foot chain-link fence. Surrounding this fence is an undisturbed buffer zone to insure physical isolation of the central restricted zone. Where the burial facility is on a DOE reservation, the reservation serves as a buffer zone. To protect the general public from any radioactivity unintentionally released from the facility, routine radiation monitoring of the air and water associated with the site and periodic environmental surveillance is carried out to detect inadvertent contamination of biota and persons residing in the region of the facility.

Scrap containing low levels of uranium and technetium which is suitably prepared by compaction and containerizing could be buried in this type of facility. Presently, shallow-land burial facilities for government-generated low-level waste are located at most major DOE installations (Figure 6.1).[4]

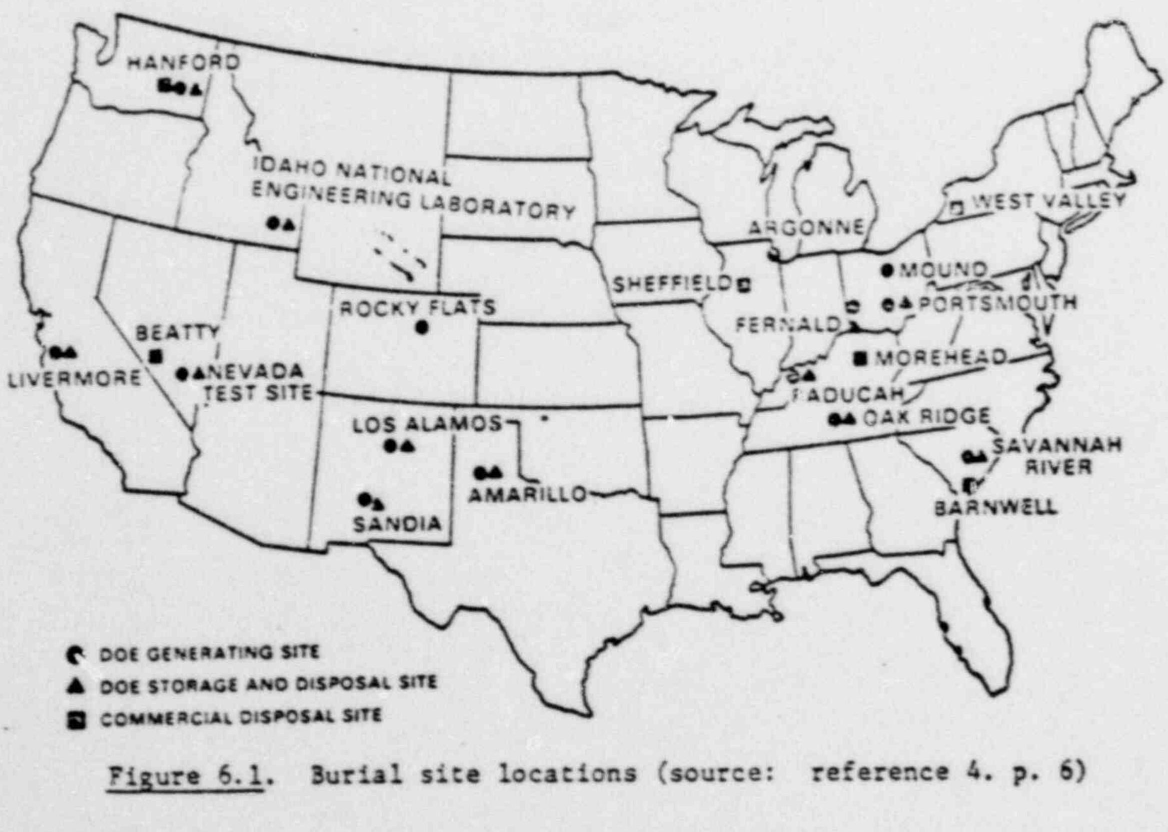


Figure 6.1. Burial site locations (source: reference 4. p. 6)

1) An exemption of smelted metal contaminated with uranium enriched up to 20% uranium-235 providing the total uranium content in the metal does not exceed 17.5 parts per million; and 2) The addition of technetium-99 at a concentration of $8.6 \times 10^{-2}$ microcuries/gram (equivalent to 5 parts per million) to Column II, Schedule A, 10 CFR 30.70, "Exempt Concentrations."

Neither proposal was acceptable from a regulatory control viewpoint.

The first proposal did not clearly exclude source material or other special nuclear material from the proposed exemption and did not indicate whether alloys (such as steel, brass, Zircaloy) would be covered by the proposed exemption.

The second proposal would have authorized the introduction of technetium-99 into any commodity or product. It also attempted to add to Schedule A, 10 CFR 30.70 a byproduct material concentration that would meet neither the schedule's criterion for concentration (the lowest value for a radionuclide given in Table I of the National Bureau of Standards Handbook 69 for continuous occupational exposure) nor the criterion for byproduct material half-life (less than 3 years).

With regard to establishment of the technetium-99 limit, the staff took into account the factors that result in the concentration of fission product technetium-99 on or in enrichment plant scrap. During the enrichment process, technetium deposits on all materials that come in contact with uranium hexafluoride. In the case of scrap metal generated in the Cascade Improvement Program and Cascade Upgrading Program, the combination of feed material specification (maximum technetium-99 beta particle activity only 10 percent of the beta activity of aged natural uranium), deposition rates, and mechanical and chemical decontamination results in scrap metal contaminated with a maximum of 5 parts per million technetium-99. */Comment Note 1/*

There is essentially no removal of technetium from metal during smelting processes. Accordingly, the staff has proposed for smelted alloy a concentration of 5 parts per million technetium-99 which is achievable by mechanical and chemical decontamination techniques prior to smelting scrap metal. The production laboratories of smelters can confirm the level of residual technetium-99 contamination after the smelted alloy has been poured into billet or ingot molds or made into semi-finished products. */Add Note 2/*

The staff believes the 5 parts per million technetium-99 limit will cover scrap from uranium hexafluoride conversion plants, uranium production plants, and other plants having parts that come in contact with uranium hexafluoride and/or fission products of uranium.

Not readily apparent from the language of the proposals was the problem that, absent specific licensing requirements for smelting scrap, any person possessing contaminated metal scrap could melt or fuse the metal scrap and transfer smelted metal to exempt persons for uncontrolled use.

*Comment Note 1:* *This statement is incorrect. The phrase "maximum of 5 ppm..." should be changed to "average of less than 5 ppm..."*

*Add Note 2:* *The analyses given in Section 4 indicate that contamination at these levels will have a negligible impact on man and the environment.*

Table 7.4. Revenues expected from sale of smelted contaminated copper

| Year | Quantity of Copper (Mg)** | Forecasted Price ($/Mg)† | Current Year* Value | Present Value†† |
|---|---|---|---|---|
| 1979 | 327 | $2,500 | $847,000 | $806,000 |
| 1980 | 655 | $2,620 | $1,716,000 | $1,593,000 |
| 1981 | 655 | $2,650 | $1,736,000 | $1,573,000 |
| Totals | 1,600 | | | $3,972,000 |

*Value in current year in 1977 dollars.
**Reference 5, p. 2.
†Table 3.6 in Section 3.2.2.
††Present (1977) value in 1977 dollars at 2.5% real rate of discount.

Table 7.5. Contaminated copper scrap burial costs avoided

| Year | Quantity of Copper ~~($m^3$)~~ (Mg) | Volume of Copper ($m^3$)* | Unit Costs ($/$m^3$) | Current Year Costs** | Present Value of Costs† |
|---|---|---|---|---|---|
| 1979 | 327 | 3.65 | $1,800 | $6,570 | $6,300 |
| 1980 | 655 | 7.32 | $1,800 | $13,176 | $12,200 |
| 1981 | 655 | 7.32 | $1,800 | $13,176 | $11,900 |
| Totals | 1,600†† | | | | $30,400 |

*Reference 6, p. A-25, $19.58/ton in 1978 dollars converted to $20.59/Mg in 1977 dollars using wholesale price index (195.1/204.1), in 1977 dollars.
**Cost in current year in 1977 dollars.
†Present (1977) value of costs in 1977 dollars at 2.5% real rate of discount.
††Reference 5, p.2.

### 3.3.2.4 Iron and steel industry structure and pricing patterns

In 1975 there were 175 companies producing a variety of iron and steel products. In 1974, 20 of these firms were vertically integrated with blast furnaces, steelmaking furnaces and finishing mills and 10 firms producted 80% of the raw steel in the U.S. in 1967. (See Table 3.10)

The majority of the iron and steel industry in the United States is located near the lower Great Lakes parts in Illinois, Indiana, Michigan, Ohio, and western Pennsylvania. The large vertically integrated steel mills are in northern New York, eastern Pennsylvania, eastern Maryland and Alabama.

Table 3.10. Raw steel production in the United States in 1967

| Company | Production (Mg) | Percent of Total | |
|---|---|---|---|
| U.S. Steel | ~~28,000,000~~ | 24.3 | 28,030,000 |
| Bethlehem | ~~9,000,000~~ | 16.1 | 18,620,000 |
| Republic | ~~8,500,000~~ | 7.3 | 8,440,000 |
| National | ~~8,700,000~~ | 6.7 | 7,710,000 |
| Armco | ~~7,800,000~~ | 5.9 | 6,760,000 |
| Jones and Laughlin | ~~6,300,000~~ | 5.4 | 6,250,000 |
| Inland | ~~6,200,000~~ | 5.3 | 6,150,000 |
| Youngstown | ~~5,100,000~~ | 4.4 | 5,110,000 |
| Wheeling-Pittsburgh | ~~2,900,000~~ | 2.5 | 2,860,000 |
| Kaiser | ~~2,600,000~~ | 2.3 | 2,600,000 |
| Total* | ~~93,000,000~~ | 80.2 | 92,530,000 |
| Total Industry | ~~116,000,000~~ | | 115,400,000 |

*Top ten steel producing companies
SOURCE: Reference 28.

The iron and steel industry has had a history of administered pricing policies. A few large firms, such as U.S. S[illegible] (29) called "price leaders" set the prices of iron and steel products a[illegible] fixed plus marginal costs and a target rate of return. These announced price increases are generally followed by other iron and steel companies, but these price increases are subject to certain constraints. Foreign producers in Japan and Europe, which are partly subsidized

Only three* facilities licensed to accept commercial waste are presently in operation. These sites are located near Barnwell, South Carolina, Beatty, Nevada, and Richland Washington (Figure 6.1). Tables 6.1[5] and 6.2[6,7] summarize operations at the various burial facilities.

The total capacity of the presently operational commercial sites can be estimated. From Table 6.2, the total capacity of the sites is:

$$(2 \times 10^6) + (7 \times 10^5) + (9 \times 10^5) = 3.6 \times 10^6 \text{ m}^3$$

Using an average scrap density value of 800 kg/m$^3$,[8] the total capacity would be

$$800 \times (4 \times 10^6) = 2.9 \times 10^9 \text{ kg} \quad \text{or} \quad 3 \times 10^6 \text{ Mg}$$

Thus the shallow land burial of the total CIP/CUP scrap (Table 2.1) at the presently operating commercial sites would require only a little over 1% of their total burial capacity. *[add Note 1]*

The burial option for unsmelted scrap metal would result in some radiation exposure to the scrap handlers and to the public. CIP/CUP scrap would probably be buried at the Oak Ridge site since it is located near the diffusion enrichment plants. Because the distance is short, scrap would probably be shipped by truck. Radiation doses can be calculated assuming an average of 100 ppm uranium and 5 ppm technetium-99 in the unsmelted scrap,[9] with no other special nuclear material, an average shipping distance of 300 km through country with an average population density of 130 persons per square kilometer, and using dose methodology similar to that used for smelted metal in Section 4.3.1.1 and Appendix B. Scrap crane operators would receive about $7 \times 10^{-4}$ man-rem while loading and unloading shipments. Bystanders in contact with the shipment could receive $3 \times 10^{-4}$ man-rem, with persons living along the route of the shipment getting another $7 \times 10^{-5}$ man-rem. The highest potential doses would go to truck drivers, who for all shipments might receive $1 \times 10^{-2}$ man-rem. All of these doses are very small.

### 6.1.4 Surface storage of contaminated scrap

For material contaminated with very low levels of radioactivity storage above ground is sometimes used. The prevailing philosophy is that this mode of storage is only temporary (less than 100 years). However, since the material is placed above ground and thus not strictly isolated from the environment as in burial, stricter operational controls are required to provide adequate security. Material may be placed directly in the reserved area as is, or placed in some type of container. The area is fenced off from the public as at the burial site to control access. A more elaborate method of above-ground

*However, the actual number of commercial facilities actually open for operation at any future date is highly unpredictable.

*Add Note 1:* *However, it should be noted that while shallow land burial is permitted under current regulations, it is possible that more restrictive criteria will be imposed in the future, at both the State and Federal levels. Requiring burial as hazardous waste would substantially increase burial costs and reduce the number of suitable burial sites due to more stringent criteria.*

Table 1.1. Summary of radiological doses derived from the smelting and uncontrolled release of metal alloy generated from the CIP/CUP program

| | |
|---|---|
| Maximum Individual Total-Body Dose Rate (working 1000 hr/yr inside "vault") | 0.01 rem/yr |
| Maximum Individual Total-Body Dose Commitment (daily ingestion of iron tonic over 1 year) | 0.002 rem |
| Maximum Individual Local Skin Dose (dose to wrist from bracelet worn 50 years) | 14.0 rem |
| Maximum Individual Contact Bone Dose (dose from pin implanted 50 years) | 20 rem *not consistent with Table 4.12.* |
| Occupational (total scrap smelting [Table 4.13]) | 0.01 person-rem |
| General Population (total scrap) Worst Cast Scenario of Transport, Manufacture, Distribution and Use [Table 4.11] | 80 person-rem |
| Health Effects from Population Dose | <1 |

Table 1.2. Comparison of net benefits in millions of dollars (1977) for three smelting alternatives for iron and steel

| | Smelter | | |
|---|---|---|---|
| Scrap | Oak Ridge | Commercial | Fernald |
| Nickel* | 34.2 | 34.2 | 34.2 |
| Copper** | 2.3 | 2.3 | 2.3 |
| Iron & Steel | 5.1 | 1.8 | 0.6 |
| **Total** | 41.6 | 38.3 | 37.1 |

*Nickel is assumed to be smelted at Paducah, KY only.
**Copper is assumed to be smelted at Fernald only.

Table 4.12. Summary of potential individual doses from the release of smelted alloy containing 17.5 ppm uranium and 5 ppm Tc-99

| Product | Dose* (rem) | Remarks |
|---|---|---|
| Iron: | | |
| Slag Roadbed** | 3E-7 | per trip |
| Eroded Slag** | 2E-4 | 50-yr commitment |
| Pans | 2E-6 | primarily external dose |
| Structures: | | |
| 0.16-cm-sheet | 1E-1 | spending 1000 hr/yr inside |
| 10-cm-"vault" | 1E-5 | spending 1000 hr/yr inside |
| Desk | 5E-6 | using 2000 hr/yr |
| Buckles | 4E-4 | beta skin dose to local area from wearing 5840 hr/yr |
| Bone Pin | 2E-1 | dose to bone in contact with pin carried 50 yr |
| Tonic | 2E-3 | 50-yr commitment from 1-yr intake |
| Copper: | | |
| Pennies | 5E-5 | |
| Bracelets | 3E-1 | beta skin dose to local area from wearing 5840 hr/yr |
| Nickel: | | |
| Nickels | 2E-5 | |
| Sheet Structures | 2E-6 | spending 1000 hr/yr inside |

*not consistent with Table 1.1.*

*Annual dose to total body from one year exposure to external radiation unless otherwise noted.
**See footnote ** of Table 4.11.

Estimates of the risk of cancers and genetic effects per unit of radiation exposure vary greatly.(2,3,4,5) The risk factors employed in this study are taken from a recent Environmental Impact Statement on the Management of Commercially Generated Radioactive Waste.(4) These risk factors are presented in Table 4.14. We believe that these risk factors are appropriate for estimating health implications from radiation. Without discussing the merits,