

U.S. DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

**The U.S. Tungsten Market**

by

**Kim B. Shedd<sup>1</sup>**

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# The U.S. Tungsten Market

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This review of the U.S. tungsten market was prepared to be presented at the 14<sup>th</sup> Annual General Meeting of the International Tungsten Industry Association at Guangzhou, China, on October 8-9, 2001.

# Overview

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- USGS Minerals Information Team
- U.S. tungsten market in 2000



I'll start with some background information on the U.S. Geological Survey's Minerals Information Team. Then I'll present some of our statistics on the U.S. tungsten market.

## Minerals Information Team Mission

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The USGS Minerals Information Team provides information and analysis required to ensure that the Nation can have an adequate and dependable supply of minerals and materials to meet its defense and economic needs at acceptable environmental, energy, and economic costs.



Our program has been ongoing for more than a century. It is currently a part of the U.S. Geological Survey which is under the Department of the Interior. We collect statistics and information on the domestic and international supply of and demand for minerals and mineral-based materials. We analyze this information and then make it available to other Government agencies, industry, academia, and the public.

The information we provide is used for decision-making. Our mission, as shown here, is to ensure that we have an adequate and dependable supply of minerals and materials to meet our defense and economic needs at acceptable environmental, energy, and economic costs.

## Coverage

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- More than 100 mineral commodities
- More than 170 countries



We collect statistics and information on more than 100 mineral commodities. In addition to metals, this includes industrial minerals such as aggregates, agricultural chemicals, and clays.

We follow mining and mineral processing activities in more than 170 countries.

## Sources of Statistics

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- U.S. production, consumption, and stocks
  - USGS surveys
  - Defense National Stockpile Center
- U.S. imports and exports
  - U.S. Census Bureau

» more...



A key part of our program is our voluntary surveys of U.S. industry. We have more than 150 surveys of various sectors of the U.S. mining, mineral processing, and consuming industries. More than 18,000 U.S. producers and consumers participate in our surveys. Data for these surveys are collected on a monthly, quarterly, or annual basis.

We also use statistics from other government agencies such as the Defense National Stockpile Center of the Defense Logistics Agency and the Census Bureau.

## Sources of Statistics, continued

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- U.S. and international prices
  - Trade journals
- Statistics for other countries
  - Foreign governments, U.S. Department of State, industry associations, company reports, trade journals, conference proceedings, etc.



The prices we cite in our reports are published prices from trade journals. A few years ago we published a book on metal prices. It has a 3- to 4-page chapter on each metal and presents prices and events that influenced the markets from 1959 to 1998.

We use a wide variety of sources to compile statistics on other countries. These include foreign governments, the U.S. State Department, industry associations such as the International Tungsten Industry Association, company reports, trade journals, and conference proceedings.

## The U.S. Tungsten Market in 2000

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- Supply
  - Production
  - Imports
  - National Defense Stockpile sales
  - Scrap
  - Industry stocks



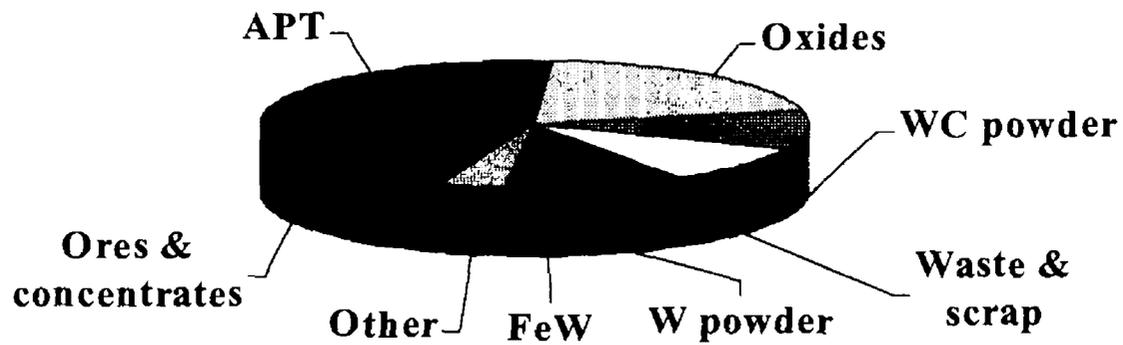
I'll focus this presentation on the U.S. tungsten industry, beginning with information on supply, and then demand.

U.S. Production -- In 1955, there were more than 740 tungsten mines operating in the United States. Many of them were very small -- more than 90% of U.S. tungsten production was from 40 mines. At that time, record production levels as well as high levels of imported concentrates were the result of a U.S. Government program to purchase materials for the National Strategic Stockpile.

In contrast, today there are no operating U.S. tungsten mines. The last mine production was from the Andrew Mine northeast of Los Angeles, California, in 1992. Although mine production from the Pine Creek Mine in the Sierra Nevada Mountains east of San Francisco, California, ceased in 1990, the mill at Bishop continued producing concentrates from stockpiled ores into 1994.

Our raw materials supply now comes from imports, sales from the National Defense Stockpile, scrap recycling and reprocessing, and industry stocks.

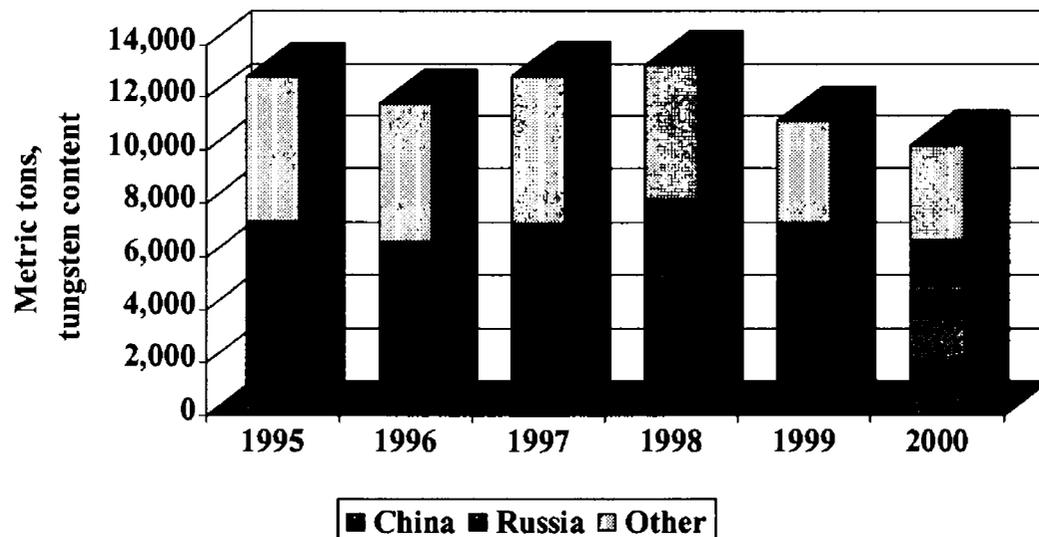
## U.S. Imports of Tungsten Materials in 2000



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We import a full range of tungsten materials. In 2000, two thirds of our imports were as ores & concentrates, ammonium paratungstate (APT), and oxides, in nearly equal amounts. We imported 1,000 tons of tungsten as tungsten carbide (WC) powder, almost 600 tons of tungsten metal powder, and nearly 1,000 tons of tungsten in waste & scrap.

## Total Imports of Tungsten Materials to the United States

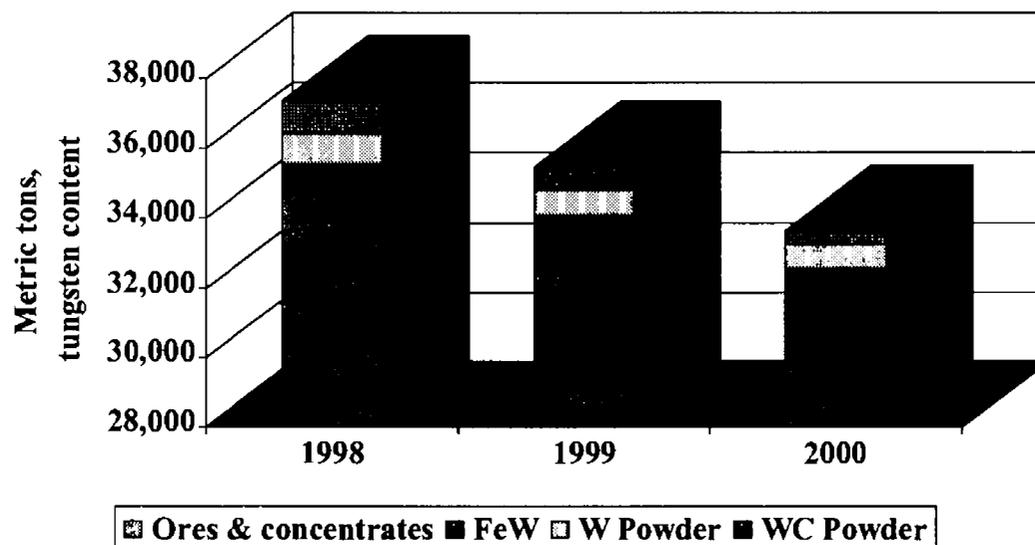


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This chart shows the source of U.S. tungsten imports since 1995. It represents the tungsten content of all tungsten materials imported -- concentrates, ferrotungsten, APT, powders, wrought products, chemical compounds, and waste & scrap. In 1999 and 2000 approximately two thirds of U.S. imports was from China and Russia.

During the past 2 years, total imports were lower than those of the previous 4 years. In 1999 and 2000, the United States consumed increasing amounts of tungsten-bearing scrap. Sales of tungsten materials from the National Defense Stockpile began in 1999.

## National Defense Stockpile Uncommitted Inventory



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For many decades, the United States has maintained a stockpile of strategic minerals for use during a national emergency. Periodically, the quantities and types of materials in the stockpile are evaluated to determine whether materials should be bought or sold.

In 1992, after the end of the Cold War, the Department of Defense decided to reduce the levels of most of the materials in the stockpile. Sales of tungsten materials began in mid 1999. Before sales began, the stockpile held more than 37,000 tons of tungsten in ores and concentrates, ferrotungsten, tungsten metal powder, and tungsten carbide powder. This graph shows the amount of “uncommitted inventory” available for sale at the end of each calendar year. As of December 31, 2000, there was 33,600 tons of tungsten remaining in the stockpile.

## National Defense Stockpile

(Metric tons, tungsten content)

	1999		2000	
	Sold	Shipped	Sold	Shipped
Ores & concentrates	1,352	< ½	1,363	1,235
FeW	148	--	597	143
W powder	104	< ½	71	104
WC powder	284	< ½	576	345
Total	1,888	< ½	2,608	1,827



This table shows tungsten sales and shipments during calendar years 1999 and 2000. Sales began in 1999, but not much material was shipped until 2000.

## National Defense Stockpile

(Metric tons, tungsten content)

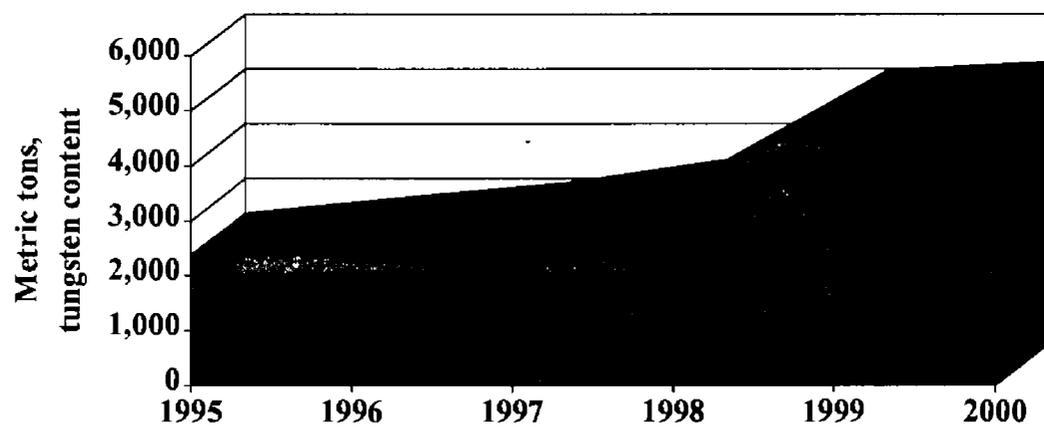
	Annual Materials Plan FY 2001
Ores & concentrates	1,814
FeW	136
W powder	136
WC powder	454
Total	2,540



The Annual Materials Plan represents the maximum amount of each material that can be sold from the stockpile during the fiscal year.

This chart shows the revised Annual Materials Plan for the fiscal year that began October 1, 2000, and ended September 30, 2001. The same maximum quantities of each material were proposed for sales during the new fiscal year that just began last week.

## Scrap Consumption by U.S. Processors and Consumers



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As I mentioned previously, scrap is an important component of U.S. supply. It is used by processors and by consumers.

The amount of tungsten scrap consumed by U.S. industry has been increasing. In 2000, U.S. processors and consumers used more than 5,000 tons of tungsten in scrap.

We have been working on a series of special reports describing and quantifying metals recycling in the United States. Completed reports on various metals are available from our website. The draft report on cobalt is currently in review and I'll be starting a report on tungsten soon.

## The U.S. Tungsten Market in 2000

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### Demand

- U.S. processors and their production
- Apparent consumption
- Reported consumption



Now I'll discuss demand.

## Larger U.S. Tungsten Processors in 2000

Company	Plant location(s)
Allegheny Technologies Inc.	Huntsville, AL
General Electric Co.	Euclid, OH
Kennametal Inc.	Latrobe, PA, & Fallon, NV
OM Group, Inc.	St. George, UT & Midland, MI
Osram Sylvania Inc.	Towanda, PA

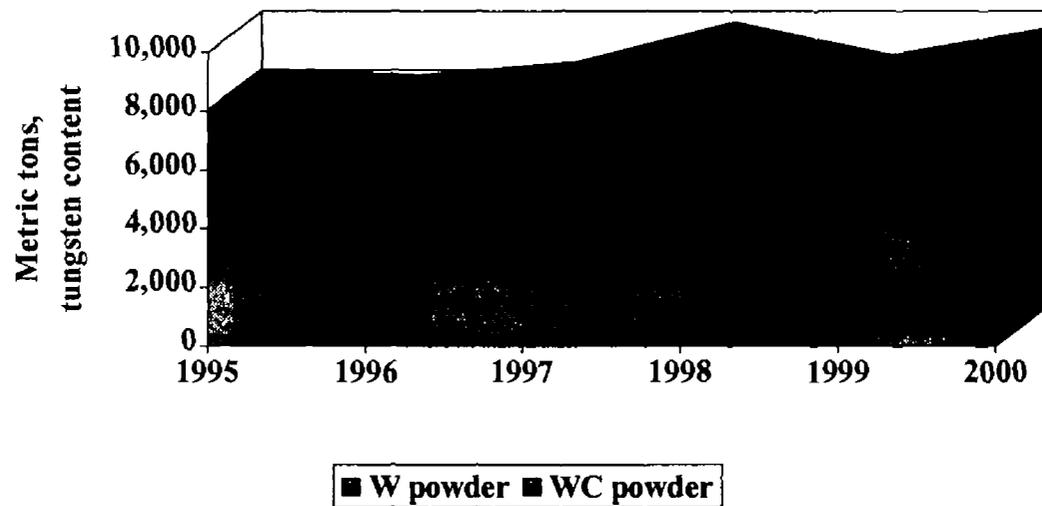


This chart lists the larger U.S. tungsten processors in the year 2000. Some of these companies process concentrates and/or scrap; others begin with APT or oxides.

Avocet Tungsten (also known as U.S. Tungsten) is not on this list because they ceased operations in March 2000 and sold the equipment and property in Bishop, CA, in July 2000. Prior to closing, they were a consumer of tungsten concentrates.

U.S. processors produced more than 7,000 tons, contained tungsten, as APT in 1999. In 2000, U.S. production of APT increased. The actual amount of APT produced in 2000 is withheld to avoid disclosing company proprietary data.

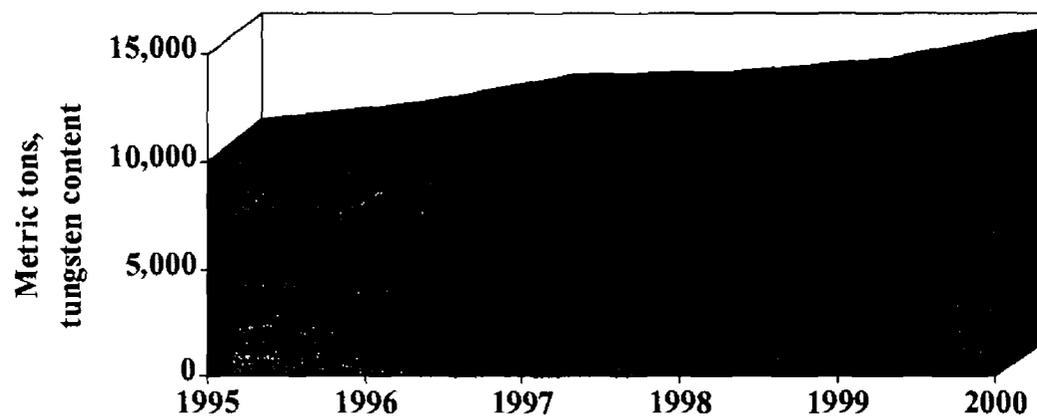
## U.S. Net Production of Tungsten Powders



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This slide shows U.S. net production of tungsten metal powder (on the bottom) and tungsten carbide powder (on the top). Net production was highest in 1998, decreased in 1999, then rebounded in 2000.

## U.S. Apparent Consumption



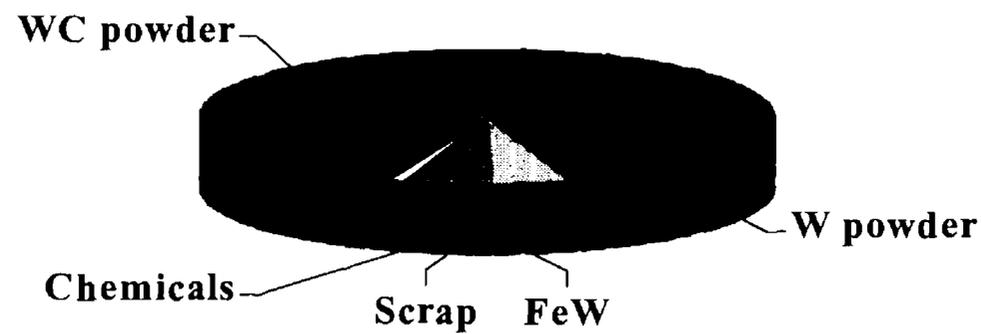
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Apparent consumption is calculated from imports minus exports plus production from scrap plus Government stockpile shipments and adjustments for changes in industry stock levels.

This chart shows the apparent consumption of all forms of tungsten.

U.S. apparent consumption has steadily increased from about 10,000 tons in 1995 to more than 14,000 tons in 2000.

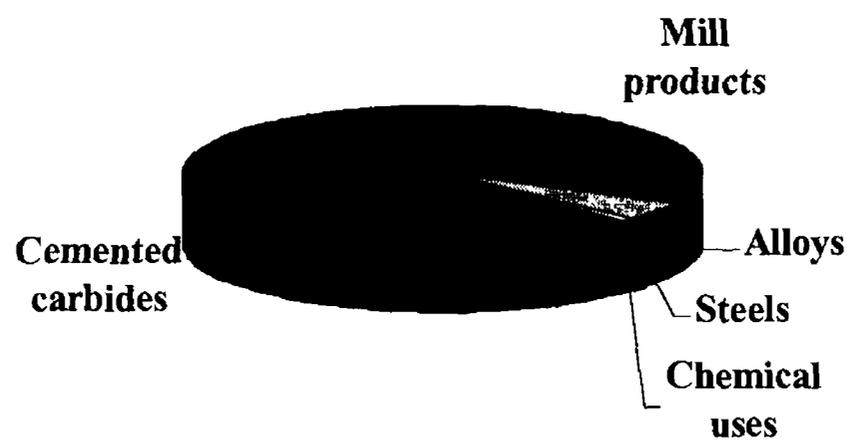
## U.S. Reported Consumption by Form in 2000



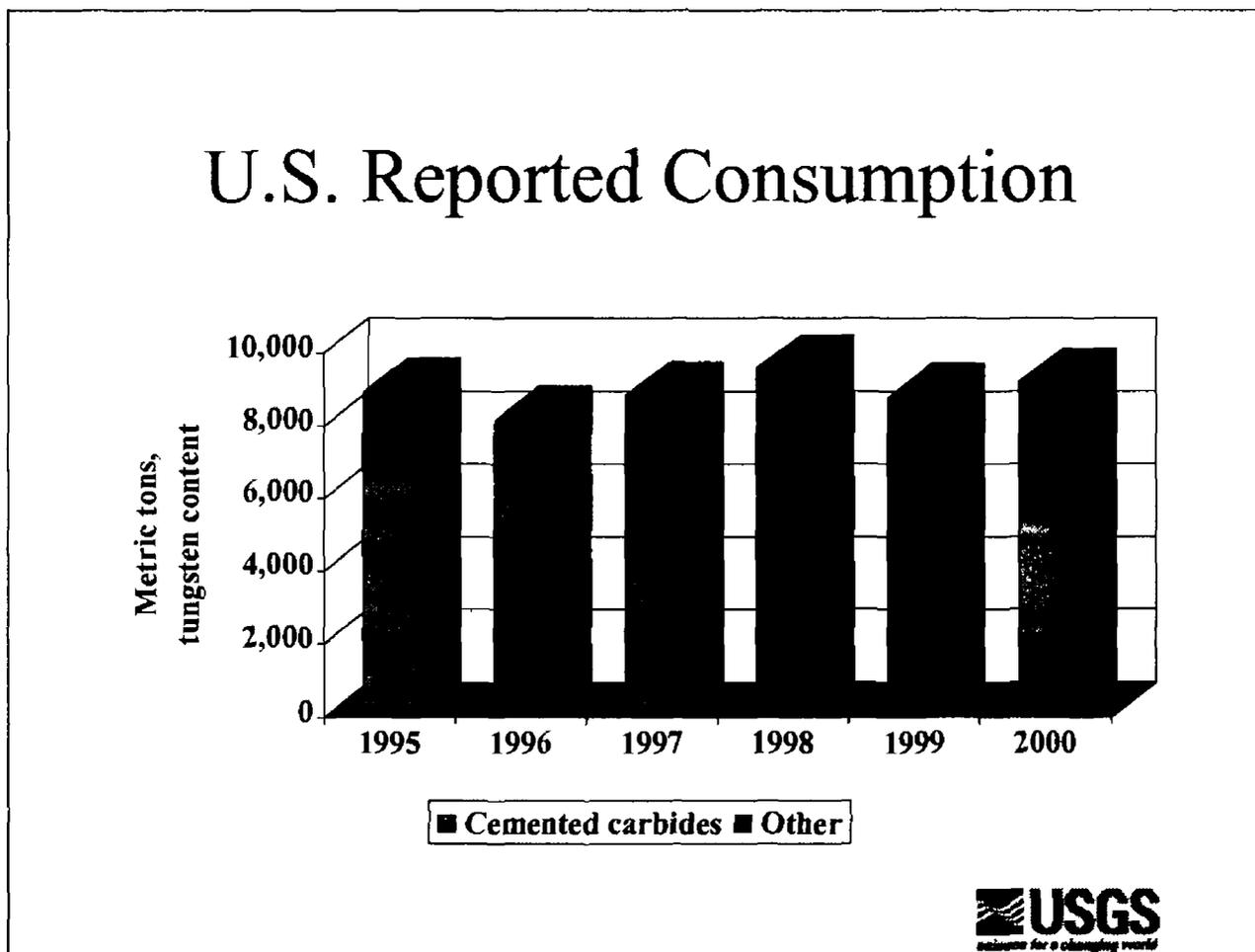
U.S. consumers use ferrotungsten, tungsten metal powder, tungsten carbide powder, tungsten chemicals, and/or scrap to make end use products.

Nearly two thirds of the tungsten consumed in the United States is in the form of tungsten carbide powder, one quarter is metal powder, 5% is scrap, 4% is ferrotungsten, and 1% is chemicals.

## U.S. Reported Consumption by End Use in 2000



This slide shows the distribution of U.S. tungsten consumption by end use. Cemented carbides remained the largest use, representing about two thirds of the total. The next largest use was mill products, followed by alloys, steels, and chemical uses such as catalysts and pigments.



This chart shows recent trends in reported consumption by end use consumers. Consumption to make cemented carbides is on the bottom, consumption to make other products is on the top. During the past 6 years, the average reported consumption was 8,900 tons. Similar to the trend shown for net production of powders, reported consumption was highest in 1998, decreased in 1999, but rebounded in 2000.

Also, note that the portion of tungsten used to make cemented carbides relative to the total has decreased. During this 6-year period, reported consumption to make alloys and mill products has increased, and they now represent a larger portion of total reported tungsten consumption.

## Summary

- U.S. Geological Survey's Minerals Information Team
- Recent trends in U.S. tungsten supply and demand
- <http://minerals.usgs.gov/minerals>



In summary, I've given some background on our program to collect and distribute worldwide statistics and information on minerals and metals.

I've presented some recent trends in U.S. tungsten supply and demand. Over the past 5 years apparent consumption has steadily increased. Imports have been replaced to a certain degree by an increase in consumption of scrap and materials shipped from the National Defense Stockpile. Cemented carbides remain the largest use for tungsten, although their share of the U.S. market has decreased slightly relative to other uses.

More detailed information is available in our publications, which are loaded on our website at this URL.