# Metals/Minerals - 202% US Import Dependence, Key Uses

## 100% Import Dependent

- **Arsenic**
  - Lumber preservatives, pesticides, lead acid batteries, solar cells
- **Tantalum**
  - Electronic components, gas turbine alloys
- **Strontium**
  - Pyrotechnics, ceramic magnets, drilling fluids
- **Scandium**
  - Alloys, fuel cells, electronics
- **Rubidium**
  - Electronics, glass
- **Rare Earths**
  - Catalysts, ceramics, glass, alloys, metallurgy
- **Niobium**
  - Steel alloys
- **Manganese**
  - Steel production
- **Indium**
  - LCD screens, electrical components
- **Graphite**
  - Lubricants, batteries, fuel cells, steel making
- **Gallium**
  - Integrated circuits, optical devices (LEDs)
- **Fluorspar**
  - Aluminum manufacturing, gasoline, uranium fuel, refrigerants
- **Cesium**
  - Oil/gas well drilling, fuel cells
- **Yttrium**
  - Catalysts, ceramics, metallurgy, jet engines
- **Asbestos**
  - Oil industry, rubber sheet, vehicle friction products
- **Mica (sheet)**
  - Oil drilling, roofing, rubber products

## 96% - >50% Import Dependent

- **Vanadium**
  - Metal, steel, uranium alloys
- **Tellurium**
  - Cooling, energy production, solar cells, cast iron production
- **Bismuth**
  - Used in medical/atomic research
- **Potash**
  - Fertilizer, chemical, & industrial apps
- **Titanium**
  - >88% White pigment, metal alloys
- **Diamond**
  - 84% Computer chips, O&G drilling, transportation
- **Zinc**
  - 83% Metal galvanizing
- **Antimony**
  - 81% Flame retardants, metal products, ceramics, glass
- **Silver**
  - 80% Electricity, electricity conductivity, batteries, plastics
- **Platinum**
  - 79% Catalytic agents
- **Rhenium**
  - 76% Lead-free gasoline, super alloys
- **Cobalt**
  - 76% Rechargeable batteries, superalloys
- **Barite**
  - >75% Oil/gas drilling
- **Bauxite**
  - >75% Cement, petroleum industries
- **Iron Oxide**
  - >75% Concrete, construction materials
- **Tin**
  - 75% Coatings & alloys for steel
- **Chromium**
  - 75% Stainless steel, other alloys
- **Gold**
  - >52% Electrical/electronics
- **Tungsten**
  - >50% Wear-resistant metals
- **Germanium**
  - >50% Fiber optics, solar cells
- **Lithium**
  - >50% Batteries, EVs
- **Nickel**
  - >50% Steel alloys

Note: Navy type indicates on USGS Critical List 2022
Red type highlights some key energy uses

Source: USGS; Methodological Note to the Inventory of Export Restrictions on Industrial Raw Materials

*Titanium mineral concentrates*
Green electrification related copper demand by region

- Renewable Demand
  - ROW
  - China
  - US

- Projection
  - China: +Roughly 1,400 kmt
  - US: +Roughly 700 kmt
  - EU: +Roughly 1,000 kmt

2020 total global copper demand: approx. 1,000 kmt

Copper, 5 Year Price Chart

- From approx. $5000/kmt to over $10,000 in four years

140 M EVs by 2030 in IEA’s SDS X 183 lbs. of copper/EV = 11.6 million Mt of copper for EVs

Global production, 2020: approx. 20 million Mt

US uses (%): building construction, 43%; electrical and electronic products, 21%; transportation equipment, 19%; consumer and general products, 10%; and industrial machinery and equipment, 7%.
EIA: In 2016, there were 160,000 miles of high voltage transmissions lines.

Princeton NZA (E+RE pathway with base land availability): The US will need a 75% increase in transmission capacity by 2030 to meet net zero targets. Assume 60% of that capacity is achieved by adding new miles (the other 40% is met with technology improvements).

60% of 96,000 miles of new high voltage transmission lines by 2030 translates to 72,000 miles.

There are between 5 and 5.6 towers per mile on a high voltage transmission line (credible numbers range from 5 to 5.6).

At 5 towers/mile, we will need 360,000 transmission towers by 2030.

Transmission towers are made of steel, aluminum and copper, among other materials. So are transmission lines. So are wind turbines. So are cell towers. So are EVs. So are EV charging stations.

https://www.eia.gov/todayinenergy/detail.php?id=27152