



DEPARTMENT OF THE INTERIOR

Geological Survey

[GX22GS00EMMA900]

2021 Draft List of Critical Minerals

AGENCY: U.S. Geological Survey, Department of the Interior.

ACTION: Notice of Opportunity for Public Comment.

SUMMARY: The United States remains heavily dependent on imports of certain mineral commodities that are vital to the Nation’s economic and national security interests. This dependency has the potential to create strategic vulnerabilities arising from adverse foreign actions, pandemics, natural disasters, or other events that can disrupt the supply of critical minerals. The Department of the Interior (DOI) published a list of 35 critical minerals¹ or mineral groups on May 18, 2018, in response to Executive Order 13817 – A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals.

DATES: To ensure consideration, written comments must be submitted before [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: You may submit written comments online at <http://www.regulations.gov> by entering “DOI-2021–xxxx” in the Search bar and clicking “Search,” or by mail to Draft List of Critical Minerals, MS-102, U.S. Geological Survey, 12201 Sunrise Valley Dr, Reston, VA 20192.

FOR FURTHER INFORMATION CONTACT: James Mosley, (703) 648-6312, jmosley@usgs.gov. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Relay Service (FRS) at 1–800–877–8339 to contact Mr. Mosley during normal business hours. The FRS is available 24 hours a day, 7 days a week, to leave a message or

¹ Final Critical Minerals List 2018 <https://www.federalregister.gov/documents/2018/05/18/2018-10667/final-list-of-critical-minerals-2018>.

question with this individual. You will receive a reply during normal business hours. Normal business hours are 9:00 a.m. to 5:30 p.m., Monday through Friday, except for Federal holidays.

SUPPLEMENTARY INFORMATION: Pursuant to Section 7002 (“Mineral Security”) of Title VII (“Critical Minerals”) of the Energy Act of 2020 (The Energy Act) (Public Law 116–260, December 27, 2020, 116th Cong.)², the Secretary of the Interior (The Secretary), acting through the Director of the U.S. Geological Survey, and in consultation with the Secretaries of Defense, Commerce, Agriculture, and Energy and the United States Trade Representative, is to “publish in the Federal Register for public comment— (A) a description of the draft methodology used to identify a draft list of critical minerals; (B) a draft list of minerals, elements, substances, and materials that qualify as critical minerals; and (C) a draft list of critical minerals recovered as byproducts and their host minerals. ” Under the Energy Act, Sec. 7002 (c)(5)(A) the methodology and list shall be reviewed at least every 3 years.

On behalf of the Secretary, the Associate Director for Natural Hazards exercising the authority of the Director of the U.S. Geological Survey presents here a draft list of 50 mineral commodities proposed for inclusion on the 2021 list of critical minerals: Aluminum, antimony, arsenic, barite, beryllium, bismuth, cerium, cesium, chromium, cobalt, dysprosium, erbium, europium, fluorspar, gadolinium, gallium, germanium, graphite, hafnium, holmium, indium, iridium, lanthanum, lithium, lutetium, magnesium, manganese, neodymium, nickel, niobium, palladium, platinum, praseodymium, rhodium, rubidium, ruthenium, samarium, scandium, tantalum, tellurium, terbium, thulium, tin, titanium, tungsten, vanadium, ytterbium, yttrium, zinc, and zirconium.

Much of the increase in the number of mineral commodities, from 35 commodities and groups on the final 2018 list to 50 commodities on the 2021 draft list, is the result of splitting the rare earth elements and platinum group elements into individual entries rather than including

² Energy Act of 2020 (Division Z of the Consolidated Appropriations Act, 2021):
<https://rules.house.gov/sites/democrats.rules.house.gov/files/BILLS-116HR133SA-RCP-116-68.pdf>.

them as mineral groups. In addition, the 2021 draft list adds nickel and zinc and removes helium, potash, rhenium, and strontium. The Energy Act of 2020 explicitly excluded fuel minerals from the definition of a critical mineral and the Mining and Mineral Policy Act of 1970³ formally defined uranium as a mineral fuel, so uranium was not evaluated for inclusion on the 2021 draft list of critical minerals.

Minerals were included on the 2021 draft list of critical minerals based on three evaluations: 1) a quantitative evaluation wherever sufficient data were available, 2) a semi-quantitative evaluation of whether the supply chain had a single point of failure, and 3) a qualitative evaluation when other evaluations were not possible. The report⁴ describing the methodology and the technical input from the U.S. Geological Survey may be found at the following link: <https://doi.org/10.3133/ofr20211045> and further details are summarized in the supplementary information section below. The U.S. Geological Survey seeks comments on the make-up of the draft list and the rationale associated with potential additions or subtractions to the draft list as described in the methodology report.

The Energy Act of 2020, Section 7002(c)(4)(A), defined critical minerals as those which:

- (i) “are essential to the economic or national security of the United States;
- (ii) the supply chain of which is vulnerable to disruption (including restrictions associated with foreign political risk, abrupt demand growth, military conflict, violent unrest, anti-competitive or protectionist behaviors, and other risks through-out the supply chain); and
- (iii) serve an essential function in the manufacturing of a product (including energy technology-, defense-, currency-, agriculture-, consumer electronics-, and healthcare-

³ Mining and Minerals Policy Act of 1970 https://openet.org/wiki/Mining_and_Minerals_Policy_Act_of_1970.

⁴ Nassar, N.T., and Fortier, S.M., 2021, Methodology and technical input for the 2021 review and revision of the U.S. Critical Minerals List: U.S. Geological Survey Open-File Report 2021–1045, 31 p., <https://doi.org/10.3133/ofr20211045>.

related applications), the absence of which would have significant consequences for the economic or national security of the United States.”

Section 7002(a)(3)(B) further defined the term by stating that “The term “critical mineral” does not include –

- (i) fuel minerals;
- (ii) water, ice, or snow;
- (iii) common varieties of sand, gravel, stone, pumice, cinders, and clay.”

The Mining and Minerals Policy Act of 1970, 30 U.S.C. section 21(a), defined “mineral fuels” as “including oil, gas, coal, oil shale and uranium”. Based on these definitions, uranium was not evaluated for inclusion on the 2021 draft list of critical minerals.

The U.S. Government and other organizations may also use other definitions and rely on other criteria to identify a material or mineral as "critical" or otherwise important. This list is not intended to replace related terms and definitions of materials that are deemed strategic, critical or otherwise important (such as definitions related to the National Defense Stockpile, Specialty Materials, and Militarily Critical Materials). In addition, there are many minerals not listed on the critical minerals list that are important to the U.S. economy. These materials are not considered critical as defined by the Energy Act because the U.S. largely meets its needs for these through domestic mining and processing and thus a supply disruption is considered unlikely.

The 2021 draft list of critical minerals is based on a methodology developed over several years with leadership by the U.S. Geological Survey and interagency input coordinated by the White House Office of Science and Technology Policy’s National Science and Technology Council (NSTC) Critical Minerals Subcommittee. The 2021 update to the methodology was published by the U.S. Geological Survey in 2021 (<https://doi.org/10.3133/ofr20211045>) and includes three evaluations: 1) a quantitative evaluation wherever sufficient data were available, 2) a semi-quantitative evaluation of whether the supply chain had a single point of failure, and 3)

a qualitative evaluation when other evaluations were not possible. The quantitative evaluation is an enhancement of the NSTC methodology published in 2018 (<https://doi.org/10.3133/ofr20181021>) and used to develop the 2018 list of critical minerals. The 2021 quantitative evaluation uses A) a net import reliance indicator of the dependence of the U.S. manufacturing sector on foreign supplies, B) an enhanced production concentration indicator which focuses on production concentration outside of the United States, C) weights for each producing country's production contribution by its ability or willingness to continue to supply the United States, and converts the 2018 methodology's qualitative evaluation of economic importance into a quantitative evaluation of economic vulnerability for the U.S. manufacturing sector. Further details on the underlying rationale and the specific approach, data sources, and assumptions used to calculate each component of the supply risk metrics are described in the references cited in this notice.

Table 1 shows the result of the review of the list of critical minerals for 2021, ranked in order of decreasing supply chain risk when a quantitative evaluation was possible. The table columns indicate whether each mineral commodity recommended for inclusion on the 2021 draft list of critical minerals, the basis for the recommendation (quantitative evaluation, single point of failure, or qualitative evaluation), whether the commodity was included in on the 2018 final list of critical minerals, and whether it is produced primarily as a byproduct of another mineral commodity. Of the sixty-six mineral commodities listed in Table 1, fifty-four (82% of the minerals considered) could be evaluated using the quantitative NSTC methodology. This includes mineral commodities that are recommended for inclusion on the list based on a single point of supply chain failure, as applicable, even if the commodity did not meet the quantitative threshold cutoff. See methodology references for further details.

Table 1. Summary of Evaluation of Mineral Commodities for the 2021 List of Critical Minerals.

Highest to lowest supply chain risk, based on quantitative evaluation ⁵	Mineral commodity	Included on draft 2021 list of critical minerals?	Basis for recommended inclusion	On 2018 list of critical minerals?	Predominantly recovered as byproduct? ⁶
1	Gallium	Yes	Quantitative evaluation	Yes	Yes
2	Niobium	Yes	Quantitative evaluation	Yes	No
3	Cobalt	Yes	Quantitative evaluation	Yes	Yes
4	Neodymium	Yes	Quantitative evaluation	Yes	Yes
5	Ruthenium	Yes	Quantitative evaluation	Yes	Yes
6	Rhodium	Yes	Quantitative evaluation	Yes	Yes
7	Dysprosium	Yes	Quantitative evaluation	Yes	Yes
8	Aluminum	Yes	Quantitative evaluation	Yes	No
9	Fluorspar	Yes	Quantitative evaluation	Yes	No
10	Platinum	Yes	Quantitative evaluation	Yes	No
11	Iridium	Yes	Quantitative evaluation	Yes	Yes
12	Praseodymium	Yes	Quantitative evaluation	Yes	Yes
13	Cerium	Yes	Quantitative evaluation	Yes	Yes
14	Lanthanum	Yes	Quantitative evaluation	Yes	Yes
15	Bismuth	Yes	Quantitative evaluation	Yes	Yes
16	Yttrium	Yes	Quantitative evaluation	Yes	Yes
17	Antimony	Yes	Quantitative evaluation	Yes	Yes
18	Tantalum	Yes	Quantitative evaluation	Yes	No
19	Hafnium	Yes	Quantitative evaluation	Yes	Yes
20	Tungsten	Yes	Quantitative evaluation	Yes	No
21	Vanadium	Yes	Quantitative evaluation	Yes	Yes
22	Tin	Yes	Quantitative evaluation	Yes	No
23	Magnesium	Yes	Quantitative evaluation	Yes	No
24	Germanium	Yes	Quantitative evaluation	Yes	Yes
25	Palladium	Yes	Quantitative evaluation	Yes	Yes
26	Titanium	Yes	Quantitative evaluation	Yes	No
27	Zinc	Yes	Quantitative evaluation	No	No
28	Graphite	Yes	Quantitative evaluation	Yes	No
29	Chromium	Yes	Quantitative evaluation	Yes	No
30	Arsenic	Yes	Quantitative evaluation	Yes	Yes
31	Barite	Yes	Quantitative evaluation	Yes	No
32	Indium	Yes	Quantitative evaluation	Yes	Yes
33	Samarium	Yes	Quantitative evaluation	Yes	Yes
34	Manganese	Yes	Quantitative evaluation	Yes	No
35	Lithium	Yes	Quantitative evaluation	Yes	No
36	Tellurium	Yes	Quantitative evaluation	Yes	Yes
37	Lead	No	Not applicable	No	No
38	Potash	No	Not applicable	Yes	No
39	Strontium	No	Not applicable	Yes	No
40	Rhenium	No	Not applicable	Yes	Yes
41	Nickel	Yes	Single point of failure	No	No

⁵ Ranked in order from highest to lowest risk based on a recency-weighted mean of the commodities' overall supply risk scores. See the published methodology (<https://doi.org/10.3133/ofr20211045>) for further details.

⁶ Most mineral commodities are recovered as byproducts to some degree, but the share of primary production as a byproduct for the mineral commodities that are not identified as byproducts in the table is typically small. Rare earth elements (REEs) are mined both as byproducts of other mineral commodities (for example, iron ore or heavy-mineral sands) and as the main product. Where REEs are mined as the main product, the individual REEs are either byproducts or coproducts of each other. For simplicity, all REEs are labeled in the table as having been produced mostly as byproducts. Byproduct status can and does change, although notable changes over short periods of time are rare.

42	Copper	No	Not applicable	No	No
43	Beryllium	Yes	Single point of failure	Yes	No
44	Feldspar	No	Not applicable	No	No
45	Phosphate	No	Not applicable	No	No
46	Silver	No	Not applicable	No	Yes
47	Mica	No	Not applicable	No	No
48	Selenium	No	Not applicable	No	Yes
49	Cadmium	No	Not applicable	No	Yes
50	Zirconium	Yes	Single point of failure	Yes	Yes
51	Molybdenum	No	Not applicable	No	No
52	Gold	No	Not applicable	No	No
53	Helium	No	Not applicable	Yes	Yes
54	Iron ore	No	Not applicable	No	No
(⁷)	Cesium	Yes	Qualitative evaluation	Yes	Yes
(⁸)	Erbium	Yes	Qualitative evaluation	Yes	Yes
(⁸)	Europium	Yes	Qualitative evaluation	Yes	Yes
(⁸)	Gadolinium	Yes	Qualitative evaluation	Yes	Yes
(⁸)	Holmium	Yes	Qualitative evaluation	Yes	Yes
(⁸)	Lutetium	Yes	Qualitative evaluation	Yes	Yes
(⁸)	Rubidium	Yes	Qualitative evaluation	Yes	Yes
(⁸)	Scandium	Yes	Qualitative evaluation	Yes	Yes
(⁸)	Terbium	Yes	Qualitative evaluation	Yes	Yes
(⁸)	Thulium	Yes	Qualitative evaluation	Yes	Yes
(⁸)	Uranium	Not evaluated	Not applicable	Yes	No
(⁸)	Ytterbium	Yes	Qualitative evaluation	Yes	Yes

Table 1 includes 11 mineral commodities that are not recommended for inclusion on the 2021 list of critical minerals. These mineral commodities did not meet the NSTC quantitative evaluation criteria, were determined not to have a single point of failure and were not included on the 2018 list of critical minerals. These eleven commodities (17% of the minerals evaluated) are: lead, copper, feldspar, phosphate, silver, mica, selenium, cadmium, molybdenum, gold, and iron ore, ranked in order of their overall supply chain risk. While several of these are essential mineral commodities, their supply chain vulnerability is mitigated by domestic production, lack of import dependence, and diverse, secure sources of supply.

Mineral commodities that did not meet the criteria for the NSTC quantitative evaluation, but that have an identified single point of supply chain failure and an essential economic

⁷ Commodities that were not evaluated using the quantitative evaluation are not given a rank and are ordered alphabetically.

⁸ USGS Mineral Commodity Summaries 2021 <https://pubs.usgs.gov/periodicals/mcs2021/mcs2021.pdf>.

function, are recommended for inclusion on the 2021 list of critical minerals regardless of whether the commodities in question were on the 2018 list. Examples are beryllium and zirconium, which were on the 2018 list, and nickel, which was not. Increasing demand for nickel as a component for producing cathodes for lithium-ion batteries, and the limited mining, smelting, and refinery capacity in the United States make a compelling case for inclusion.

Zinc, which was not on the 2018 list of critical minerals, was above the quantitative threshold for inclusion on the 2021 draft list of critical minerals due to the increasing concentration of mine and smelter capacities globally and the continued refinement and development of the quantitative evaluation criteria.

Potash, rhenium, and strontium were on the 2018 list of critical minerals but do not meet the quantitative threshold and do not have a single point of failure. Potash, strontium, and rhenium have supply risk scores just below the quantitative threshold. This highlights the fact that the metrics developed with this methodology are best viewed as a continuum of supply risk rather than an indication that supply risk does not exist for commodities below the quantitative cutoff. These three commodities all had very high trade exposure but low disruption potential. This reflects the fact that, while the United States was highly net import reliant for all three commodities, the production of these minerals was either not highly concentrated or was concentrated in countries considered to be reliable trade partners. Any changes in the supply chain dynamics of these commodities will be closely monitored, but none of the three is recommended for inclusion on the 2021 draft list of critical minerals.

Helium (like potash, rhenium, and strontium) was on the 2018 list of critical minerals but does not meet the quantitative threshold nor have a single point of failure. The United States is the world's leading producer and a net exporter of helium. Helium's trade exposure score was thus 0 and, in turn, its supply risk score was 0. Crude helium was produced in more than a dozen plants across several U.S. States, and several other plants produced grade-A Helium. Therefore, helium does not qualify for inclusion on the list based on the single point of failure criterion.

Helium production outside the United States was concentrated in Qatar and Algeria. Both countries, as well as Canada, Russia, and Tanzania, are poised to increase their production as additional capacity becomes available in the near term. The Helium Stewardship Act of 2013-directed closure of the Federally managed helium reserve by the Bureau of Land Management has the potential to increase uncertainty in the market. The global shift from conventional natural gas toward shale gas, which lacks recoverable quantities of helium, also has the potential to reduce the supply of helium, especially for the United States. While these factors make helium a commodity that bears watching, it is not recommended for inclusion on the 2021 draft list of critical minerals.

There were insufficient data to quantitatively evaluate several commodities that were on the 2018 list of critical minerals: cesium, rubidium, scandium, and several REEs (europium, gadolinium, terbium, holmium, erbium, thulium, ytterbium, and lutetium). The United States has been completely net import reliant for all these commodities for many years⁸. No specific global production data were available for these commodities; however, general information suggests that production for each of these commodities is highly concentrated in a few countries. Scandium was produced mainly as a byproduct in China, Kazakhstan, the Philippines, Russia, and Ukraine. Cesium and rubidium had been produced in Australia, Canada, China, Namibia, and Zimbabwe; however, it is thought that all cesium and rubidium mine production outside of China has either ceased in recent years or come under control of Chinese companies. The REEs that were not analyzed because of the lack of data (namely europium, gadolinium, terbium, holmium, erbium, thulium, ytterbium, and lutetium) were all heavy REEs that were produced only or predominantly in China. Based on this qualitative evaluation, none of these commodities are recommended for removal from the list of critical minerals.

⁸ USGS Mineral Commodity Summaries 2021 <https://pubs.usgs.gov/periodicals/mcs2021/mcs2021.pdf>.

Mineral criticality is not static, but changes over time. This analysis represents the most recent available data for non-fuel mineral commodities and the current state of the methodology for evaluation of criticality.

Please submit written comments on this draft list by [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER] to facilitate consideration. In particular, the U.S. Geological Survey is interested in comments addressing the following topics: the make-up of the draft list and the rationale associated with potential additions or subtractions to the draft list. Before including your address, phone number, email address, or other personally identifiable information (PII) in your comment, you should be aware that your entire comment, including your PII, may be made publicly available at any time. While you can ask us in your comment to withhold your PII from public review, we cannot guarantee that we will be able to do so.

AUTHORITY: E.O. 13817, 82 FR 60835 (December 26, 2017) and The Energy Act of 2020, Section 7002 of Title VII (December 27, 2020).

Dated: November 4, 2021

James D. Applegate, Associate Director for Natural Hazards
Exercising the Delegated Authority of the Director, U.S. Geological Survey
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