



Why CMMI? (Critical Minerals Mapping Initiative)

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Technologies important to climate change mitigation and adaptation are minerals-intensive

Climate Mitigation

Energy generation

Thin-film solar PV

Offshore direct drive wind turbine

Photo credit: Testbourne, Ltd. Photo credit: US DOE

49 **In** Indium
31 **Ga** Gallium
34 **Se** Selenium
60 **Nd** Neodymium
66 **Dy** Dysprosium

Transportation

3 **Li** Lithium
6 **C** Carbon (Graphite)
27 **Co** Cobalt
28 **Ni** Nickel

Photo credit: Telsa, Inc.

Electric and hybrid vehicles

Climate Adaptation

Infrastructure



41 **Nb*** Niobium
29 **Cu** Copper
26 **Fe** Iron

*and other steel alloying elements

Production of many minerals is highly concentrated

Share of each element's global production from China

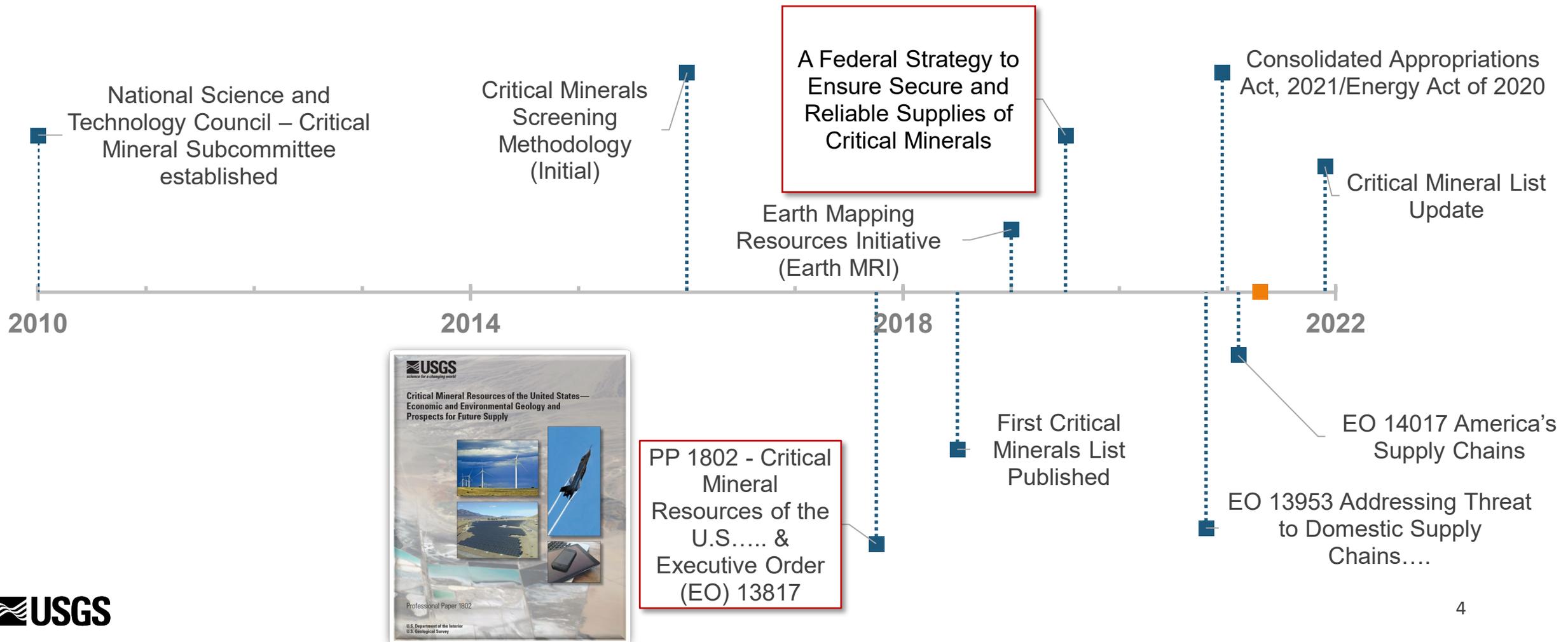
																				2 He Helium
3 Li Lithium	4 Be Beryllium											5 B Boron	6 C Carbon			9 F Fluorine				
	12 Mg Magnesium											13 Al Aluminum	14 Si Silicon	15 P Phosphorus	16 S Sulfur					
19 K Potassium			22 Ti Titanium	23 V Vanadium	24 Cr Chromium	25 Mn Manganese	26 Fe Iron	27 Co Cobalt	28 Ni Nickel	29 Cu Copper	30 Zn Zinc	31 Ga Gallium	32 Ge Germanium	33 As Arsenic	34 Se Selenium	35 Br Bromine				
	38 Sr Strontium	39 Y Yttrium	40 Zr Zirconium	41 Nb Niobium	42 Mo Molybdenum		44 Ru Ruthenium	45 Rh Rhodium	46 Pd Palladium	47 Ag Silver	48 Cd Cadmium	49 In Indium	50 Sn Tin	51 Sb Antimony	52 Te Tellurium	53 I Iodine				
	56 Ba Barium	57-71 La-Lu Lanthanides		73 Ta Tantalum	74 W Tungsten	75 Re Rhenium		77 Ir Iridium	78 Pt Platinum	79 Au Gold	80 Hg Mercury		82 Pb Lead	83 Bi Bismuth						

NOTE: Darker shades denote higher percentage of global mine production for that element (in 2018)

Unlabeled elements were not evaluated



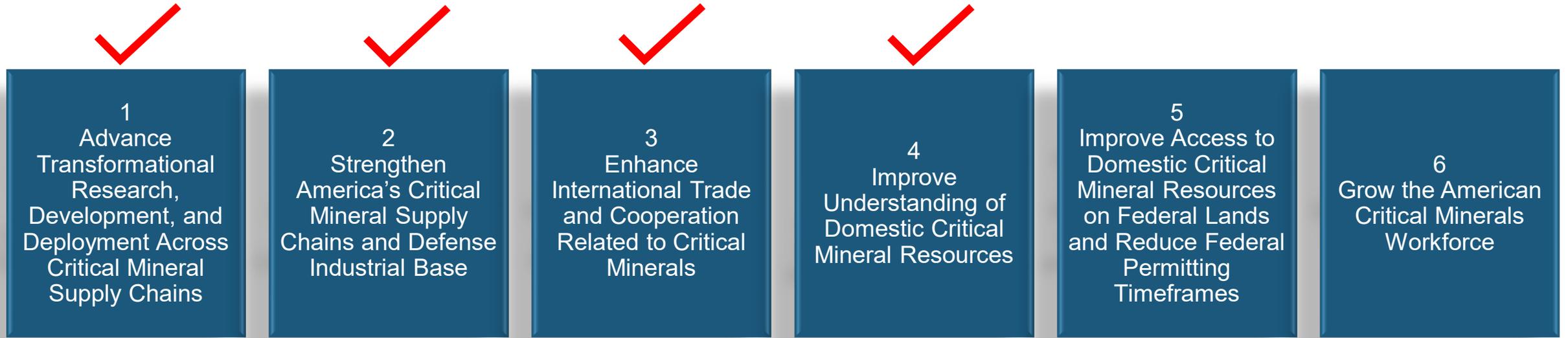
U.S. Government Coordination on Critical Mineral Supply Chains, 2010–



Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals

(U.S. Department of Commerce, 2019)

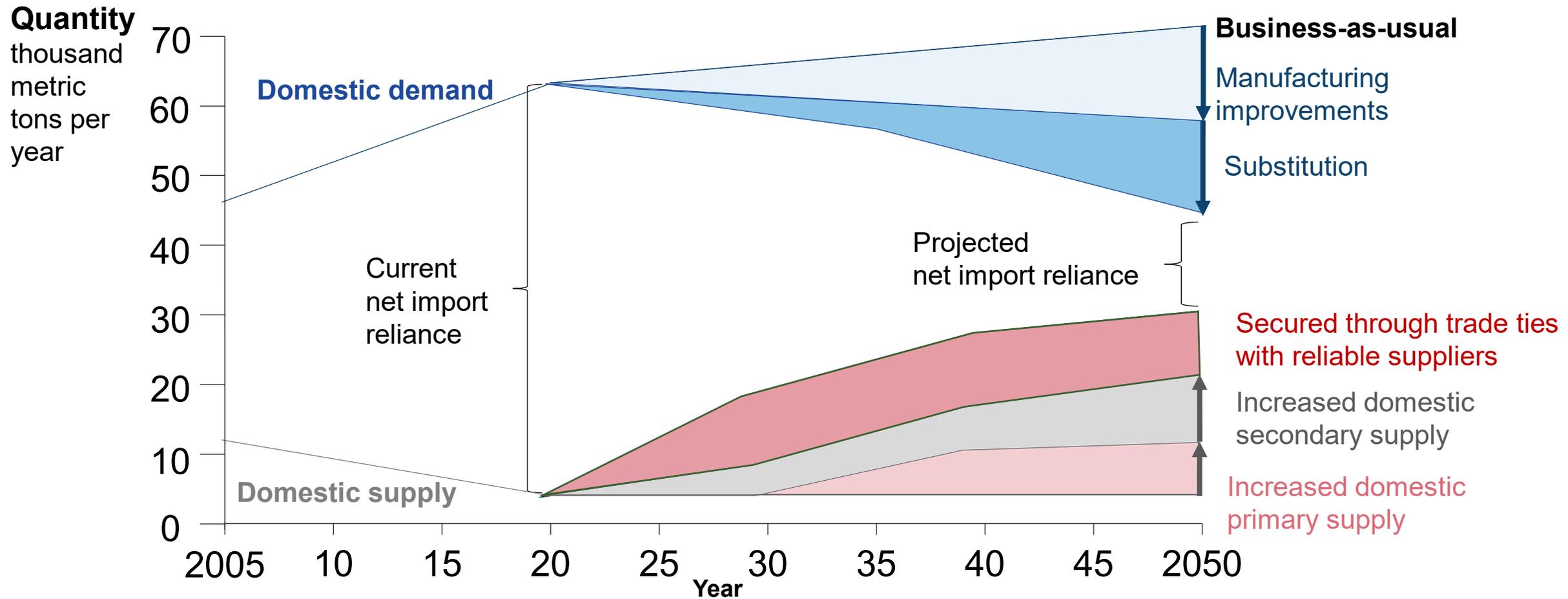
Six Calls to Action:



CMMI helps to address 4 of the 6 Calls to Action

Why CMMI?

A way of helping to address Critical Mineral Net Import Reliance



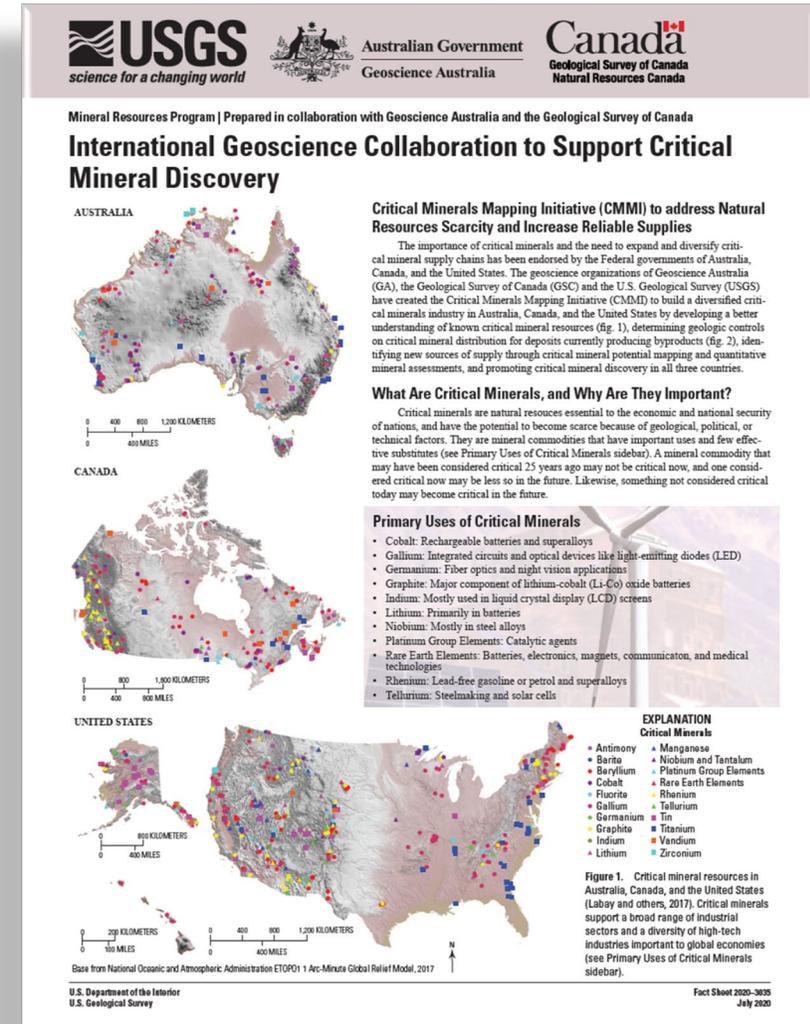
Nassar, N.T., et al., 2020, Investigation of U.S. Foreign Reliance on Critical Minerals—U.S. Geological Survey Technical Input Document in Response to Executive Order No. 13953 Signed September 30, 2020: U.S. Geological Survey Open-File Report 2020–1127, 37 p., <https://doi.org/10.3133/ofr20201127>.

Why CMMI?

In part, because it's "simple"

- GA, GSC & USGS have long histories of close collaboration.
- It was an “organic” next step for our three surveys to join together through existing bi-lateral MOUs between our Surveys. CMMI collaboration has been controlled solely by those simple, non-binding MOUs.
- “Whole is greater than the sum of its parts”

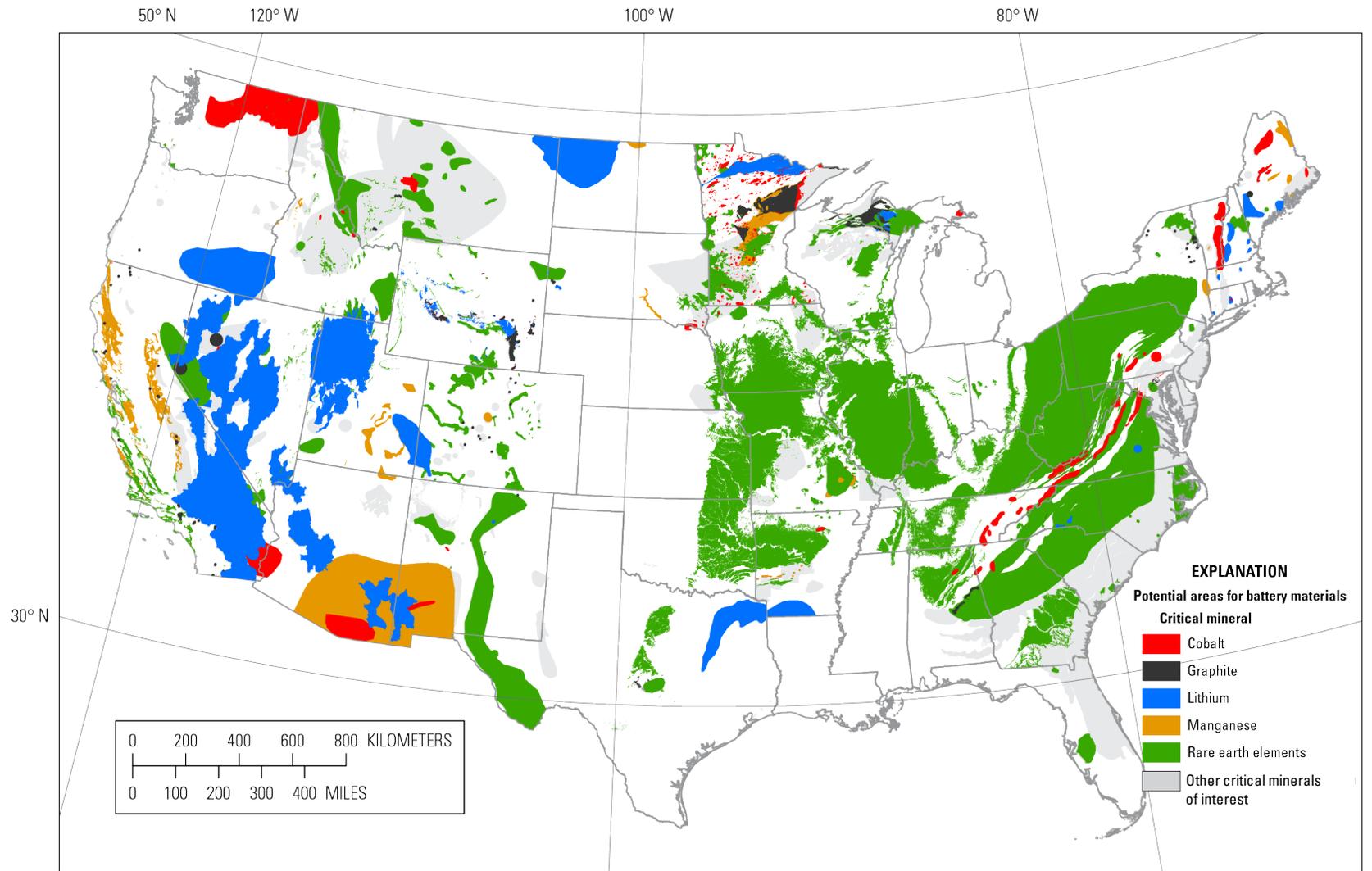
CMMI supports higher level US – Canada and US – Australia “whole-of-government” agreements regarding cooperation on critical minerals.



Example: CMMI work on Mineral Systems Classification Scheme is helping to drive U.S. Earth Mapping Resources Initiative

Earth MRI is a nationwide program of geophysical and lidar surveys plus geologic mapping focused on improving understanding of below ground and above ground (mine wastes) critical mineral resources.

The new mineral system classification scheme provides a way of linking Earth MRI surveys to the U.S. List of 35 Critical Minerals



Areas with potential subsurface mineral resources required for high-capacity batteries (cobalt, graphite, lithium, manganese, and rare earth elements) across the conterminous United States.

Dicken, C.L., and Hammarstrom, J.M., 2020, GIS for focus areas of potential domestic resources of 11 critical minerals—aluminum, cobalt, graphite, lithium, niobium, platinum group elements, rare earth elements, tantalum, tin, titanium, and tungsten: U.S. Geological Survey data release, <https://doi.org/10.5066/P95CO8LR>

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Thank You!

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