

## QUESTIONS AND ANSWERS

PLEASE REFER TO THE GENERAL FAQs SECTION OF ARPA-E'S WEBSITE ([HTTP://ARPA-E.ENERGY.GOV/?Q=FAQ/GENERAL-QUESTIONS](http://arpa-e.energy.gov/?q=faq/general-questions)) FOR ANSWERS TO MANY GENERAL QUESTIONS ABOUT ARPA-E AND ARPA-E'S FUNDING OPPORTUNITY ANNOUNCEMENTS. ADDITIONAL QUESTIONS SPECIFIC TO THIS FOA ONLY ARE INCLUDED BELOW. PLEASE REVIEW ALL EXISTING GENERAL FAQs AND FOA-SPECIFIC QUESTIONS BEFORE SUBMITTING NEW QUESTIONS TO ARPA-E.

### I. Concept Paper Phase Questions:

**Q1. WE ARE A UK HEADQUARTERED SMALL BUSINESS LOOKING TO OPEN A US-BASED OPERATION. OUR TECHNOLOGY VERY NEATLY FALLS INTO THIS PROJECT CATEGORY. DO WE HAVE TO HAVE AN ESTABLISHED LEGAL PRESENCE ALREADY BEFORE APPLYING FOR THIS FUNDING?**

**ANSWER:** Please reference MINER FOA Section III.A.3. You may apply to the FOA but an established legal presence would be required prior to funding/award. While foreign entities are typically eligible to apply for funding under ARPA-E FOAs, ARPA-E will only make an award of funding to a U.S. affiliate or subsidiary entity (i.e. incorporated in the United States or a U.S. territory). Rarely, a "foreign work waiver" may be provided by ARPA-E in order to allow performance of part of the work outside of the United States. ARPA-E's provision of a foreign work waiver is a fact dependent, case-by-case determination that is made only in exceptional circumstances and only for discrete parts of an award that necessitate foreign work. Applicants that anticipate the need for a foreign work waiver to perform some work outside of the U.S. should review the Business Assurances & Disclosures Form. Also, because eligibility criteria may vary between FOAs, ARPA-E suggests that applicants check the complete list of "Eligible Applicants" provided in the FOA under which they wish to apply to confirm they are eligible.

**Q2. I WOULD LIKE TO ASK A QUESTION FOR WHICH I CANNOT FIND A CLEAR ANSWER IN THE FAQ 6 "SUBMITTING A CONCEPT PAPER".**

**I AM WORKING AS PI ON TWO CONCEPT PAPERS FOR THE FOA MINER.**

**I HAVE CREATED TWO TEAMS WHERE SOME OF THE CO-PIS ARE INVOLVED IN BOTH PROPOSED PROJECTS WITH SIMILAR TASKS. THIS IS BECAUSE WE ARE PROPOSING TWO DIFFERENT PROCESSES WHICH HAVE SOME COMMON UNITS.**

**SO, THE QUESTION IS: CAN WE SUBMIT TWO CONCEPT PAPERS WITH MYSELF AS PI IN BOTH OF THEM AND SOME OF THE CO-PIS ALSO?**

**ANSWER:** Please refer General FAQ 6.4

**Q3. MY NAME IS \*\*\*\* REDACTED \*\*\*\* AND I AM THE \*\*\*\* REDACTED \*\*\*\*. WE ARE INTERESTED IN SUBMITTING A CONCEPT PAPER FOR THE RECENTLY RELEASED MINER FOA AND HAVE A FEW QUESTIONS.**

- 1. WE NOTICED THERE ARE 2 FOAS 0002707 AND 0002708. IS THE ONLY DIFFERENCE BETWEEN THESE TWO FOAS THE SMALL BUSINESS ELIGIBILITY REQUIREMENT FOR FOA 0002708 AND THE ANTICIPATED AWARD? I SEE REQUIREMENTS FOR SMALL BUSINESS ARE LISTED THROUGHOUT FOA 0002707. WE ARE A SMALL START UP COMPANY, WOULD WE BE ALLOWED TO APPLY FOR BOTH?**
- 2. SINCE THIS IS A DOE GRANT, WOULD YOU BE ALLOWED TO COLLABORATE WITH RESEARCH UNIVERSITIES FROM CANADA? FOR CONTEXT, WE SEE THERE IS A CANADIAN UNIVERSITY ON THE TEAMING PARTNERS LIST.**

**ANSWER:**

1. The answer to both is yes.
2. Collaboration with foreign universities may be allowed in some circumstances. See MINER FOA Section III.A.3. Foreign entities are typically eligible to apply for funding under ARPA-E FOAs, ARPA-E will only make an award of funding to a U.S. affiliate or subsidiary entity (i.e. incorporated in the United States or a U.S. territory). Rarely, a “foreign work waiver” may be provided by ARPA-E in order to allow performance of part of the work outside of the United States. ARPA-E’s provision of a foreign work waiver is a fact dependent, case-by-case determination that is made only in exceptional circumstances and only for discrete parts of an award that necessitate foreign work. Applicants that anticipate the need for a foreign work waiver to perform some work outside of the U.S. should review the Business Assurances & Disclosures Form. Also, because eligibility criteria may vary between FOAs, ARPA-E suggests that applicants check the complete list of “Eligible Applicants” provided in the FOA under which they wish to apply to confirm they are eligible.

**Q4. I HAVE A FEW QUESTIONS REGARDING THE FOA FOR THE ARPA-E MINER FOA. \*\*\*\* REDACTED \*\*\*\* HAS A PATENTED TECHNOLOGY FOCUSING ON IMPROVED MINERAL LIBERATION AND COMMINUTION. WE HAVE DONE PREVIOUS TESTING ON A WIDE RANGE OF MINERALS. THE QUESTIONS I HAVE CENTER AROUND 1.) WHAT SPECIFIC MINERALS WOULD BE CONSIDERED FOR THIS FUNDING OPPORTUNITY? 2.) WHO IS THE BEST PERSON TO CONTACT WITH THESE QUESTIONS?**

**ANSWER:** 1. Category 1 - Mineral Comminution Energy Reduction aims to reduce comminution energy and reduce unrecovered energy-relevant minerals in CO<sub>2</sub>-reactive ore. Therefore, the only constraint is from CO<sub>2</sub>-reactive ore. The term CO<sub>2</sub>-reactive ore is a composite characterized by the CO<sub>2</sub>-reactive gangue minerals (e.g., olivine, serpentine, etc.) and the conventional minerals targeted during mining (e.g., sulfides and oxides).

2. Please refer to MINER FOA Section VII.A. Agency Contacts.

**Q5. WOULD YOU BE ABLE TO PROVIDE MORE CLARIFICATION ON THIS SENTENCE IN THE PROGRAM OBJECTIVES PORTION:**

**“THE PURPOSE OF THE OBJECTIVE IS TO PROVIDE THE UNITED STATES WITH AN INCREASED DOMESTIC SUPPLY OF COPPER, NICKEL, LITHIUM, COBALT, RARE EARTH ELEMENTS, AND OTHER ELEMENTS REQUIRED FOR THE TRANSITION TO CLEAN ENERGY.”**

**SPECIFICALLY, WHAT WOULD BE INCLUDED IN “OTHER ELEMENTS”. WE HAVE DONE SOME TESTING WITH URANIUM/VANADIUM AND OTHER ON THE CRITICAL MINERALS LIST. WE ARE JUST TRYING TO DETERMINE WHAT OUR BEST PROJECT WOULD BE FOR THIS.**

**ANSWER:** All elements listed under the critical minerals list are of interest. The constraint is the elements must be recovered from the CO<sub>2</sub>-reactive minerals' chemistry if Category 2 – Improvements in Energy Relevant Mineral Yield from CO<sub>2</sub>-Reactive Minerals is pursued. If element yield is increased by Category 1 - Mineral Comminution Energy Reduction, the constraint is recovering elements from CO<sub>2</sub>-reactive ore. CO<sub>2</sub>-reactive ore is a composite characterized by the CO<sub>2</sub>-reactive gangue minerals (e.g., olivine, serpentine, etc.) and the conventional minerals targeted during mining (e.g., sulfides and oxides). The objective of Category 1 is to develop cost-reducing technologies to significantly decrease comminution energy and reduce unrecovered energy-relevant minerals in the tailings.

Q6. I AM A PROFESSOR IN ECONOMIC GEOLOGY, THE STUDY OF MINERAL DEPOSITS, \*\*\* REDACTED \*\*\*. I SAW THE MINER FOA. I AM INTERESTED IN CATEGORY 4 SENSING, ANALYZING AND ENABLING CARBONATION POTENTIAL AND MINERALIZATION, PARTICULARLY ON THE OBJECTIVE OF:

*DEVELOP SURVEYING TECHNOLOGIES TO ADVANCE EXPLORATION VECTORS OF CO<sub>2</sub> – REACTIVE ROCK FORMATIONS, QUANTIFY RESERVOIR CARBONATION, AND QUANTIFY ENERGY– RELEVANT MINERALS LEACHED AND RE-MINERALIZED DURING CARBONATION OF THE CO<sub>2</sub>-REACTIVE MINERALS.*

I DO HAVE A QUESTION. THE ANNOUNCEMENT ONLY MENTIONED MAFIC-ULTRAMAFIC ROCKS AS SOURCES OF CO<sub>2</sub> REACTIVE MINERALS, BUT SUCH MINERALS ALSO OCCUR IN LARGE QUANTITY IN MAGNESIAN SKARNS, A TYPE OF MINERAL DEPOSIT THAT FORM BY THE REPLACEMENT OF DOLOSTONE. IN MG-SKARNS THE EARLY MINERALS ARE DOMINANTLY FOSTERITE (MG-OLIVINE) AND DIOPSIDE (CA-MG PYXOENE), WITH MINOR PERICLASE. THE OLIVINE TYPICALLY HAVE STRONG RETROGRADE ALTERATION TO CHONDRODITE, HUMITE, CLINOHUMITE, AND AMPHIBOLE (ALL MG-RICH), WHICH ARE FURTHER ALTERED TO ABUNDANT SERPENTINE WITH SOME PHLOGOPITE, TALC, AND MINOR BRUCITE AND MG-RICH CHLORITE. IN CURRENT DAY THE DOMINANT MINERALS IN SUCH DEPOSITS ARE SERPENTINE AND CA-MG PYROXENE. VARIOUS PROPORTIONS OF THE SERPENTINE MAY BE FIBROUS; IN THE OLDER DAYS THEY WERE MINED FOR ASBESTOS. SUCH DEPOSITS MAY CONTAIN ECONOMIC SN, MO, FE, CU, AU, ZN-PB, U, AND B METALS. THERE WERE ALSO MINED FOR DIOPSIDE, NEPHRITE, AND ASBESTOS.

WOULD YOU ACCEPT PROPOSALS TO DEVELOP EXPLORATION VECTORS OF MG-SKARNS? THE ADVANTAGES INCLUDE THE HIGHLY CONCENTRATED CO<sub>2</sub> REACTIVE MINERALS, AND LIKELY STRONG COLLABORATION AND CONTRIBUTION FROM MINERALS COMPANIES WHO TRADITIONALLY ARE ONLY INTERESTED IN THE METALS. IF THE CARBON SEQUESTRATION IS IN COLLABORATION WITH A MINING OPERATION, THEN THE CO<sub>2</sub>-REACTIVE MINERALS WILL HAVE ALREADY BEEN MILLED TO FINE PARTICLES BY THE MINES, WHICH WILL SIGNIFICANTLY REDUCE THE COSTS OF THE CARBON SEQUESTRATION PROCEDURES. THIS WILL BE A LOT CHEAPER THAN USING MAFIC-ULTRAMAFIC ROCKS, FOR WHICH THE SEQUESTRATION OPERATIONS HAVE TO FULLY BEAR THE HUGE COST OF COMMINUTION (AND MINING).

**ANSWER:** The objective of Category 4 is to develop technology-specific methods for conducting geophysical, geochemical, and (or) geostatistical surveys for sensing and analyzing carbonation mineralization potential and progress. As the FOA states, the Category 4 constraint is CO<sub>2</sub>-reactive ore bodies, and thus, the MINER FOA is open to applicants interested in skarns characterized by CO<sub>2</sub>-reactive minerals.

The response emphasizes CO<sub>2</sub>-reactive minerals due to the nature of skarns being of metasomatic origin. The mineral associations are derived from a compositional continuum of protolith compositions (e.g., dolomite and calcite) to complete skarn mineralization. The skarn mineralogy depends on protolith composition, fluid composition, spatial relations from the fluid source (i.e., skarn mineral zoning), and P-T conditions. Therefore, even unfavorable minerals such as quartz can define part of the skarn mineralogy. Again, the applicant must emphasize that CO<sub>2</sub>-reactive minerals predominantly characterize the skarn mineralogy.

As the question further states, it is possible the CO<sub>2</sub>-reactive minerals have been milled and concentrated to fine particles by the mine. The MINER FOA is open to both ex situ and in situ approaches. Thus, the MINER FOA is open to milled CO<sub>2</sub>-reactive mineral concentrate derived from a skarn.

Lastly, the MINER FOA acknowledges that CO<sub>2</sub>-reactive ore is defined as a composite characterized by the CO<sub>2</sub>-reactive gangue minerals (e.g., olivine, serpentine, etc.) and the conventional minerals containing Sn, Mo, Fe, Cu, Au, Zn-Pb, U, and B metals as the question mentions.

## **Q7. THIS IS\*\*\* REDACTED \*\*\*. WE ARE INTERESTED IN SUBMITTING A CONCEPT PAPER FOR THE RECENTLY ANNOUNCED MINER FOA AND HAVE A FEW QUESTIONS**

### **1. OUR SPECIFIC QUESTION IS, WHAT IS THE CRITERIA TO DETERMINE IF \*POTENTIAL APPLICANT\* \*\*\* REDACTED \*\*\* IS A SMALL BUSINESS?**

**ANSWER:** Please see ARPA-E General FAQ 3.4 ([General Questions | arpa-e.energy.gov](https://arpa-e.energy.gov)).

### **2. CAN YOU TELL US MORE ABOUT THE CRITERIA FOR THE FOREIGN WORK WAIVER? THERE ARE NOT A LOT OF ANSWERS IN THE FAQs.**

**ANSWER:** While foreign entities are typically eligible to apply for funding under ARPA-E FOAs, ARPA-E will only make an award of funding to a U.S. affiliate or subsidiary entity (i.e. incorporated in the United States or a U.S. territory). Rarely, a “foreign work waiver” may be provided by ARPA-E in order to allow performance of part of the work outside of the United States. ARPA-E’s provision of a foreign work waiver is a fact dependent, case-by-case determination that is made only in exceptional circumstances and only for discrete parts of an award that necessitate foreign work. Applicants that anticipate the need for a foreign work waiver to perform some work outside of the U.S. should review the sample and template Business Assurances & Disclosures Forms (BADF) on ARPA-E eXCHANGE (Please note that that the BADF is usually required with Full Application submissions and has not been posted under the MINER FOA template documents in eXCHANGE yet. However, interested applicants may reference the BADFs listed under other ARPA-E FOAs). Also, because eligibility criteria may vary between FOAs, ARPA-E suggests that applicants check the complete list of “Eligible Applicants” provided in the FOA under which they wish to apply to confirm they are eligible.

**Q8. I AM PLANNING A CONCEPT PAPER SUBMISSION FOR THE MINER FOA AND WOULD LIKE TO REQUEST CLARIFICATION ON THE ELIGIBILITY CRITERIA OUTLINED IN THE FOA AND FAQ. FOR OUR TEAMING APPROACH, NETL (AN FFRDC) WILL LEAD THE PROJECT AND A FOREIGN ENTITY (CANADIAN SMALL BUSINESS) WILL BE A TEAMING PARTNER. THE FOREIGN ENTITY DOES NOT HAVE A US AFFILIATE OR SUBSIDIARY. THE FAQ STATES:**

***RARELY, A "FOREIGN WORK WAIVER" MAY BE PROVIDED BY ARPA-E IN ORDER TO ALLOW PERFORMANCE OF PART OF THE WORK OUTSIDE OF THE UNITED STATES. ARPA-E'S PROVISION OF A FOREIGN WORK WAIVER IS A FACT DEPENDENT, CASE-BY-CASE DETERMINATION THAT IS MADE ONLY IN EXCEPTIONAL CIRCUMSTANCES AND ONLY FOR DISCRETE PARTS OF AN AWARD THAT NECESSITATE FOREIGN WORK.***

**MY QUESTIONS ARE AS FOLLOWS:**

- 1. WE BELIEVE WE HAVE A SPECIAL CIRCUMSTANCE THAT NECESSITATES FOREIGN WORK. WHEN WILL A DETERMINATION BE MADE ON WHETHER A FOREIGN WORK WAIVER WILL BE GRANTED?**
- 2. SINCE THE FOREIGN WORK WAIVER REQUEST IS SUBMITTED WITH THE FULL PROPOSAL (PART OF THE BUSINESS ASSURANCES & DISCLOSURES FORM), COULD A CONCEPT PAPER OR FULL PROPOSAL APPLICATION BE REJECTED ON THE BASIS OF HAVING A FOREIGN ENTITY AS A TEAMING PARTNER?**

**ANSWER:**

1. Determinations on requests for Foreign Work Waivers are made prior to award.
2. An application will be considered if it meets the requirements in Section III.A. Eligible Applicants of the FOA. ARPA-E makes an independent assessment of each compliant and responsive Concept Paper and Full Application based on the FOA criteria and program policy factors in Sections V.A.1 and V.B.1 of the FOA.

**Q9. IS THE ARPA-E MINE PROGRAM INTERESTED IN OUR PROPOSAL IF WE FOCUS ON BORON?**

**ANSWER:** As the FOA states in section of MINER-DE-FOA-0002707 I.F (Technical Categories of Interest); MINER SBIR/STTR DE-FOA-002707 section I.G, the constraint is CO<sub>2</sub>-reactive ore bodies. However, boron is not listed on the critical minerals list and is not particularly energy relevant.

**Q10. I AM GLAD THAT MG-SKARN IS ALLOWED. I HAVE ANOTHER QUESTION REGARDING THE RESEARCH SITES: DO THEY ALL NEED TO BE IN THE US? COULD IT BE OVERSEAS? THERE ARE NOT MANY MG-SKARN IN THE US (AND MINERAL EXPLORATION HAS BEEN STAGNANT FOR MANY YEARS), WHICH IS THE REASON WE NEED TO DEVELOP THE TECHNOLOGIES TO FIND MORE.**

**ANSWER:** Please see ARPA-E General FAQ 3.1.

**II. Full Application Phase Questions:**

**Q11. I WOULD LIKE TO ASK A QUESTION REGARDING THE CONTENT REQUIRED FOR SECTION 1 OF THE TECHNICAL VOLUME.**

**IT IS NOT CLEAR TO ME IF THE DESCRIPTION OF THE OBJECTIVES CAN CONTAIN REFERENCES / CITATIONS OR THOSE CAN BE ADDED ONLY SECTION 2.1 OF THE TECHNICAL VOLUME.**

**MY INTERPRETATION IS THAT SECTION 1 OF THE TECHNICAL VOLUME IS VERY SIMILAR TO THE CONCEPT PAPER AND SECTION 2.1 HAS SIMILAR STRUCTURE BUT WITH MORE CITATIONS AND DETAILS ON THE OBJECTIVES WE WILL ADDRESS.**

**ANSWER:** Applicants must provide sufficient citations and references to the primary research literature to justify the claims and approaches made in the Technical Volume. Additionally, there is no page limit to bibliographic references

**Q12. WE HAVE A QUESTION REGARDING THE TEA REQUIREMENTS. CAN YOU CONFIRM THE MEANING OF THE CARBON PRICING AND OPERATING COST OF CO2? FOR THE CARBON PRICING, DOES THIS REFER TO THE COST OF PURCHASING CARBON FOR SEQUESTRATION (NEGATIVE COST) OR IS THIS AN INCENTIVE PRICING (POSITIVE REVENUE). CAN YOU PLEASE PROVIDE MORE INFORMATION ON WHAT IS INCLUDED IN THE OPERATING COST OF CO2?**

**ANSWER:** Cost of Carbon Deployment within the system assuming it is delivered to the site.

**Q13. I HAVE A QUESTION REGARDING THE ROCK TYPES, WILL ARPA-E SUPPORT TARGETING ORE BODIES THAT ARE MASSIVE SULFIDES?**

**ANSWER:** Yes

**Q14. FOR THIS PROPOSAL CAN WE USE THE NSF CURRENT AND PENDING FORMAT?**

**ANSWER:** The format should follow the instructions in the FOA.