

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. Full Application Phase Questions:

Q1. THE FOA STATES ON PAGE 184 THAT ARPA-E IS NOT INTERESTED IN FUNDING RESEARCH ON PLANT SPECIES LISTED AS FEDERAL NOXIOUS WEEDS OR INVASIVE SPECIES BY THE U.S. DEPARTMENT OF AGRICULTURE. ARE WE CORRECT IN THINKING ODONTARRHENA SPECIES ARE NOT ON THOSE FEDERAL LISTS, SO IT WOULD BE OKAY TO PROPOSE RELATED RESEARCH?

ANSWER: ARPA-E won't comment on any particular species, but applicants should be aware if their intended species meets the definition of invasive species or noxious weed at federal (USDA), state, or local levels. It could be potentially a serious hurdle for a large-scale deployment and it is the Applicant's responsibility to clearly provide a risk analysis and mitigation strategies for every species in the Applicant's proposal.

Q2. I HAVE A FEW QUESTIONS RELATED TO THE PHYTOMINES PROPOSAL.

- 1) THE CALL MENTIONS TERRESTRIAL PLANTS IN ITS DESCRIPTION AND SPECIFICALLY THE PLANT SOIL INTERFACE. WILL ARPA-E CONSIDER WORK WITH AQUATIC PLANTS IN THIS CALL?**
- 2) THE FOCUS IS ON NI, IS THERE INTEREST IN COBALT ACCUMULATION AS WELL IN THIS CALL?**
- 3) THERE IS MENTION OF CONSIDERING THE IMPACTS ON SOIL GEOCHEMISTRY. DOES ARPAE WANT INFORMATION ON HOW THE SOIL CHEMISTRY IS CHANGED FOLLOWING OUR INTERVENTIONS?**
- 4) WILL APPLICATIONS BE CONSIDERED THAT WORK WITH MULTIPLE PLANTS?**

ANSWER:

- 1) Aquatic plants in fresh water will be considered.
- 2) Nickel is the primary interest.
- 3) Yes.

4) Yes.

Q3. I RECENTLY CAME ACROSS THE PRESS RELEASE FOR THE NEW ARPA-E EXPLORATORY TOPIC "PLANT HYPERACCUMULATORS TO MINE NICKEL-ENRICHED SOILS (PHYTOMINES)" AND HAVE SOME QUESTIONS REGARDING THE SUBMISSION PROCESS FOR A PROPOSAL TO THIS PROGRAM.

- 1) ARE UNIVERSITY RESEARCHERS ELIGIBLE TO APPLY FOR A GRANT THROUGH THIS PROGRAM? ADDITIONALLY, IS THE SUBMISSION OF A CONCEPT PAPER A PREREQUISITE FOR SUBMITTING A FULL PROPOSAL?**
- 2) IF UNIVERSITY RESEARCHERS ARE ELIGIBLE, ARE THEY PERMITTED TO SUBMIT A PROPOSAL INDEPENDENTLY, OR IS IT NECESSARY FOR THEM TO HAVE AN INDUSTRY PARTNER?**

ANSWER:

- 1) Please review Section III (Eligibility Information) of the FOA for information about those that are eligible to apply. There is no Concept Paper requirement for this Exploratory Topic.
- 2) It is up to each prospective applicant to determine the composition of their proposed project team and ensure that they meet the eligibility requirements noted above.

Q4. WOULD AQUATIC PLANT SYSTEMS SUCH AS SPIRODELA POLYRHIZA BE CONSIDERED WITHIN SCOPE FOR THIS SOLICITATION?

ANSWER: So long as it is not considered a noxious weed or invasive species, aquatic species will be considered.

Q5. WOULD (SEDIMENT ASSOCIATED) PERIPHYTON -OR- ALGAE BE RESPONSIVE TO THIS FOA? ANY INSIGHT WOULD BE APPRECIATED!

ANSWER: See Section 2 (Topic Description). Only terrestrial plants are within the scope of this Exploratory Topic.

Q6. MY COLLEAGUES AND I ARE PREPARING AN APPLICATION FOR THE PHYTOMINES EXPLORATORY TOPIC AND HAD A COUPLE INITIAL QUESTIONS:

DO THE PAGE LIMITS LISTED IN THE TOPIC L TECHNICAL VOLUME TEMPLATE (20 PAGES MAX FOR SECTIONS 1-5) OVERRIDE THE 14 PAGES MAXIMUM LISTED IN THE FOA?

SECONDLY, WOULD THE PROGRAM HAVE INTEREST IN PROPOSALS THAT EXPLORE EXTRACTION TECHNIQUES?

ANSWER: 1. As noted in Required Documents Checklist in the FOA, 14 pages is the maximum for Sections 1-5 of the Full Application. The Full Application template will be corrected to be consistent with the FOA requirement.

2. Refer to the Technical Areas of Interest and Submissions Specifically Not of Interest Sections in the Exploratory Topic.

Q7. THE FOLLOWING QUESTION IS ASKED REGARDING THE “NEW ARPA-E EXPLORATORY TOPIC “PLANT HYPERACCUMULATORS TO MINE NICKEL-ENRICHED SOILS (PHYTOMINES)”:

THE FOA STATES “OPTIONALLY, APPLICANTS CAN INDICATE THE LIKELY METHODOLOGY OR METHODOLOGIES THAT WILL BE USED TO EXTRACT NICKEL FROM BIOMASS AND THE COST AND GREENHOUSE GAS (GHG) EMISSIONS ASSOCIATED WITH THESE EXTRACTION PROCESSES”.

COULD YOU PLEASE PROVIDE MORE CLARIFICATION ON THIS?

IN ADDITION TO THE FOCUS ON IMPROVING NICKEL PHYTOMINING, COULD AN APPLICANT DEDICATE ONE OF THE PROJECT PHASES TO DEVELOPING A NOVEL PROCESS FOR EXTRACTION AND RECOVERING NICKEL FROM THE HYPERACCUMULATOR?

ANSWER: Please refer to Section 6 (Submissions Specifically Not of Interest) of the Exploratory Topic.

Q8. HELLO,

- 1. WILL SUBMISSIONS THAT CONSIDER NICKEL CONTAMINATED SOILS OR SEDIMENTS (E.G., NI CONTAMINATED SEDIMENT IN CONFINED DISPOSAL FACILITIES) AS A SOURCE OF NICKEL FOR PHYTOMINING ALSO BE CONSIDERED OR ARE ONLY ULTRAMAFIC SOILS WITHIN THE SCOPE OF THE FOA?**
- 2. THE “TARGET EFFECTIVENESS” OF 200% IMPROVEMENT SEEMS A LITTLE UNCLEAR. COULD THE 200% IMPROVEMENT VS UNIMPROVED SYSTEMS INCLUDE SOIL AMENDMENTS AND/OR GENETIC MODIFICATIONS TO HYPERACCUMULATORS (SO LONG AS THE FINAL PLANT REACHES 30 MG NI/GDPB)?**
- 3. TO COMPARE MOLECULAR MECHANISMS FOR ENHANCED NI UPTAKE AND TRANSLOCATION, WE WOULD LIKE TO INCLUDE MODEL SYSTEMS (E.G., ARABIDOPSIS) AS PART OF OUR APPROACH. FROM THE FOA, THIS APPEARS TO BE ALLOWABLE, CORRECT?**
- 4. THE “TARGET EFFECTIVENESS” INCLUDES 1,000 CUBIC FEET OF SOIL. MUST THIS BE USED FOR EACH EXPERIMENT OR IS THE 1,000 CUBIC FEET A SUMMATION OF TOTAL SOIL USED THROUGHOUT THE ENTIRE PROJECT?**

ANSWER:

- 1) Contaminated soils or sediments are considered as a source.
- 2) Yes.
- 3) Yes.
- 4) ARPA-E is modifying the FOA to amend this requirement to 250 square feet scale for an experiment in the final stages of the project.

Q9. I HAVE A COUPLE OF QUESTIONS REGARDING THE "METRICS AND TECHNICAL PERFORMANCE CRITERIA"

FOR TECHNICAL AREA 1, THE FOA STATES:

"TARGET EFFECTIVENESS OF PHYTOMINING SYSTEM (MUST BE VERIFIED BY EXPERIMENTATION):

- **IMPROVED (EXPERIMENTAL) PHYTOMINING SYSTEM PRODUCES 200% OF NICKEL YIELD OF UNIMPROVED SYSTEM AND IS GREATER THAN 30 MG NI/GDPB."**

1. QUESTION: I WOULD LIKE TO CONFIRM WHAT THE UNIMPROVED SYSTEM IS.

1. IS IT THE CONVENTIONAL NICKEL EXTRACTION FROM ORES THAT WE HAVE TO COMPARE OUR PROPOSED SYSTEM WITH?

2. HOW DO WE CALCULATE A 200% INCREASE? DOES IT INCLUDE IMPROVED PLANT EXTRACTION + THE EXTRACTION PROCESS FROM THE BIOMASS?

- **"AT LAB OR CONFINED FIELD SCALE OF NO LESS THAN 1,000 CUBIC FEET OF SOIL, PHYTOMINING SYSTEM SHOULD ACCUMULATE MORE THAN 250 KG OF NICKEL PER HECTARE PER YEAR (KG NI/HECTARE/YEAR) IN HARVESTABLE PLANT BIOMASS."**

2. QUESTION: SINCE FIELD TESTING IS NOT OF INTEREST, 1,000 CUBIC FEET IS A REALLY LARGE VOLUME OF SOIL, AND IT IS NOT FEASIBLE TO DO IN A GREENHOUSE SETTING. CAN WE DO A SMALLER-SCALE STUDY AND EXTRAPOLATE THE RESULTS? OR, DO WE HAVE TO USE A SYSTEM THAT HAS 1,000 CUBIC FT. OF SOIL?

- **"PROJECT ALSO DESCRIBES A TECHNOLOGY PATHWAY TO ACCUMULATION OF GREATER THAN 500 KG NI/HECTARE/YEAR."**

3. QUESTION: CAN WE EXTRAPOLATE DATA FROM A SHORTER STUDY AT A SMALLER SCALE TO DEMONSTRATE THE ACCUMULATION?

ANSWER: 1.1. No. Unimproved system refers to the nickel yield measured in Ni/gdgb from a natural hyperaccumulator.



- 1.2. Since the unit compared is Ni/gdwb, a methodology to extract nickel from the biomass should be assumed and applied to both unoptimized and improved phytomining system.
2. See the response to Q8 above.
3. Applicants may choose to run the experiments for a season, for multiple seasons, or for a shorter period of time and extrapolate out to a year.

Q10. THE CALL ASKS FOR "AT LAB OR CONFINED FIELD SCALE OF NO LESS THAN 1,000 CUBIC FEET OF SOIL, PHYTOMINING SYSTEM SHOULD ACCUMULATE MORE THAN 250 KG OF NICKEL PER HECTARE PER YEAR (KG NI/HECTARE/YEAR) IN HARVESTABLE PLANT BIOMASS. " . DOES THIS EXPERIMENT NEED TO RUN FOR AN ENTIRE YEAR OR CAN WE MONITOR FOR 1-2 MONTHS AND EXTRAPOLATE OUT?

ANSWER: Applicants may choose to run the experiments for a season, for multiple seasons, or for a shorter period of time and extrapolate out to a year.