AMERICAN MADE
U.S. DEPARTMENT OF ENERGY

Electronics Scrap Recycling Advancement Prize (E-SCRAP)

Informational Webinar

June 18, 2024

This webinar will be recorded and posted on HeroX

Housekeeping

Two Options for Audio (select audio mode):

1. Listen through your computer:
   Click the up arrow next to the “mute” button in the bottom left corner.
   Under “Select a Speaker,” click “Same as System.”
2. Listen by telephone:
   Click the up arrow next to the “mute” button in the bottom left corner.
   Click “Switch to Phone Audio.”

To Ask a Question:

- Select the Q&A button at the bottom of your screen and type in your question.
- Questions may be answered live, but all questions will be answered in writing on HeroX.

Having Trouble With the Webinar?

- Technical difficulties: Chat the webinar host for additional support.
- A video/audio recording of this webinar and the slide deck will be made available on HeroX shortly after the event.

Topics

1. Prize Background
2. Prize Overview
3. Phase 1: Incubate – What You Need to Know
4. Phases 2 and 3– What to Expect
5. Get Started Today!
6. Questions

Who Is Behind the Prize?

- The Electronics Scrap Recycling Advancement Prize was established by:
  - The U.S. Department of Energy's (DOE's) Office of Energy Efficiency and Renewable Energy (EERE)
  - EERE's Advanced Materials and Manufacturing Technologies Office (AMMTO).
- The prize is a part of the American-Made Challenges family of prizes.
- The prize is administered by the National Renewable Energy Laboratory (NREL).

Read the Rules

Official Rules of E-SCRAP are available online:

https://americanmadechallenges.org/challenges/e-scrap/docs/E-Scrap-Prize-Rules.pdf

Or

E-SCRAP HeroX Page → Resources

E-SCRAP Background

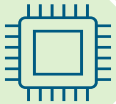
Prize Background

- DOE is working to develop secure supply chains for the critical minerals and materials that are integral to building a clean energy economy. Robust, sustainable domestic supply chains of critical materials are a vital piece to this transition.

- Critical materials serve as the building blocks for clean energy technologies. They're used in the manufacturing of magnets for wind turbine generators, batteries for electric vehicles and grid storage, semiconductors for solar panels, electrolyzers to produce hydrogen, fuel cells, and more. In many cases, they are difficult to substitute, or if they are substituted, the efficiency of the technology is reduced.

- We need to increase efficiency and circularity while decreasing environmental and health impacts of conventional mining and manufacturing.

Critical Materials – “Electric Eighteen”

Neodymium, Praseodymium, Dysprosium & Terbium		**Magnets** for wind turbine generators & EV motors
Cobalt, Lithium, Graphite, Nickel, Graphite & Fluorine		**Batteries** for electric vehicles & grid storage
Iridium & Platinum		**Electrolyzers** for green hydrogen production & **fuel cells** for energy storage
Gallium & Silicon Carbide		**Semiconductors** enable high voltage power & efficient lighting
Magnesium & Aluminum		**Lightweight alloys** in transportation
Silicon		**Solar panels**, lightweight alloys, electrical steel
Copper & Electrical Steel		Wind turbine **generators** & EV **motors**

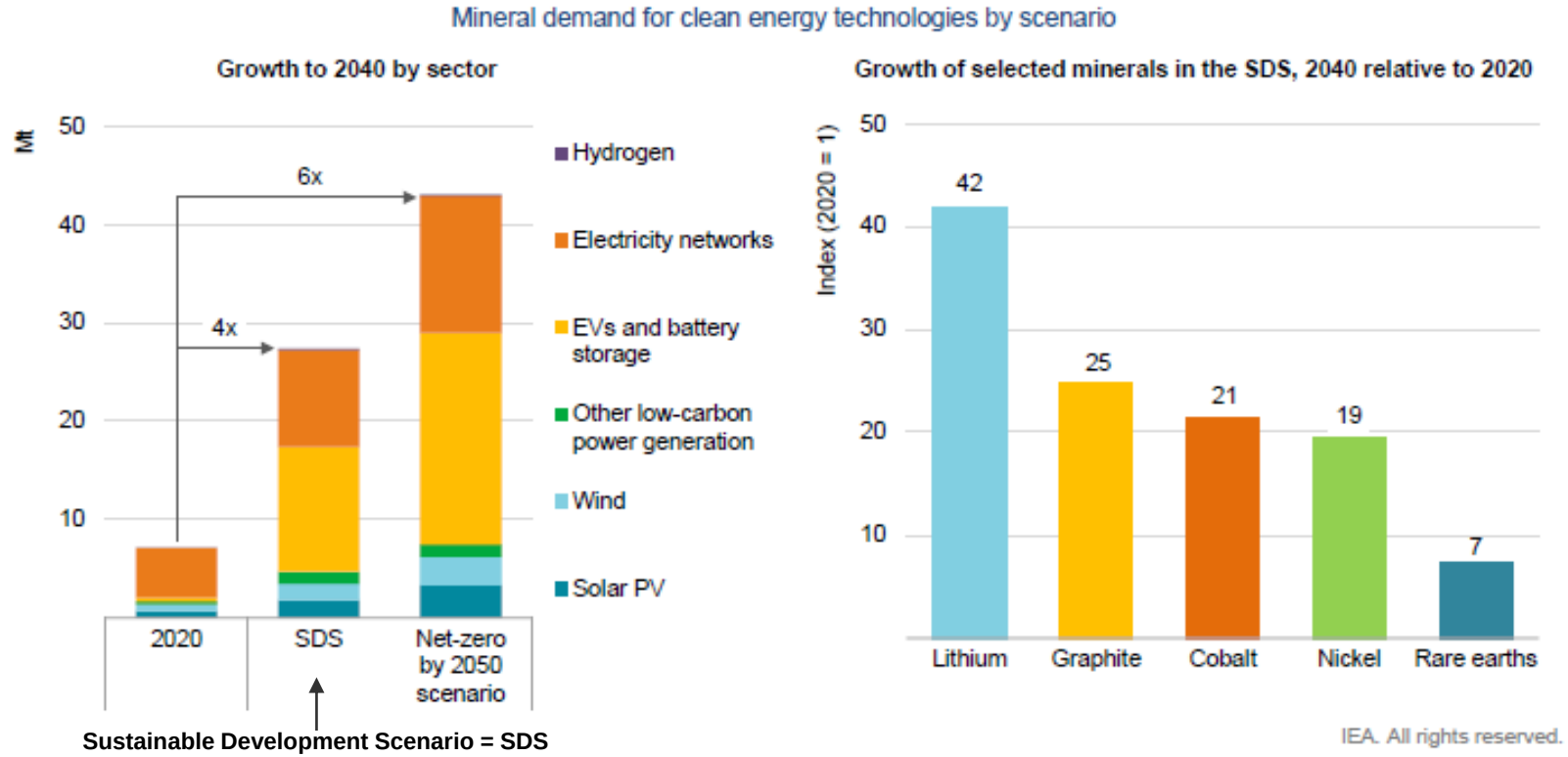
Climate Goals

- 100% clean electricity by 2035
- Net-zero economy by 2050

Clean Tech Deployment Goals

- 50% ZEV sales by 2030
- 30 GW offshore wind by 2030
- Cost of Clean Hydrogen $1/kg by 2031

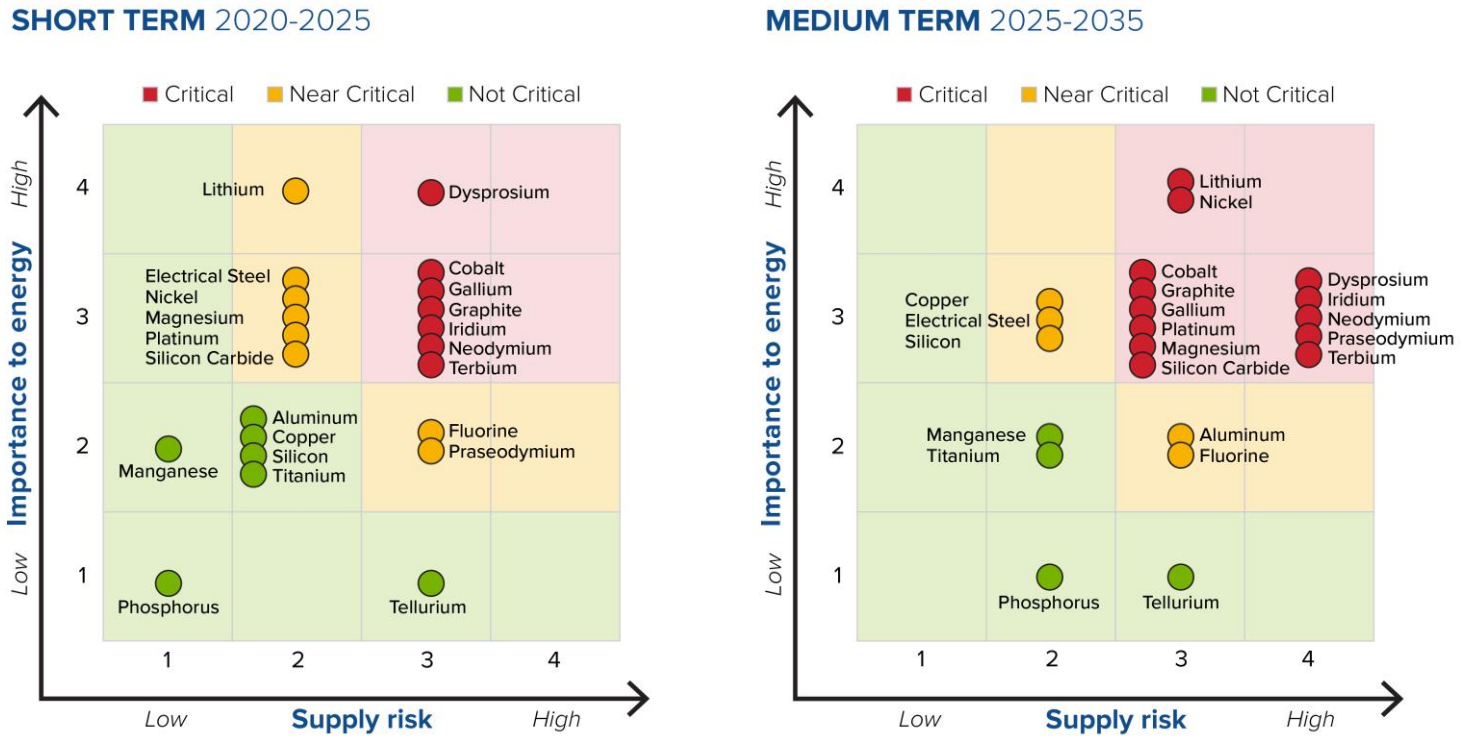
Critical Materials Demand Driven by Decarbonization Goals



Notes: Mt = million tonnes. Includes all minerals in the scope of this report, but does not include steel and aluminium. See Annex for a full list of minerals.

Source: https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions/

Criticality is a product of supply risk and importance to energy



Prize Background

- E-scrap represents the fastest growing waste stream with global e-scrap production projected to double 2014 levels by 2030. Nearly 83% of e-scrap was landfilled in 2019, representing a $47B value.

- When diverted to waste, the increasing rate of e-scrap produced by consumers poses health and environmental challenges in the United States and across the globe where electronic waste is shipped.

- Diverting and reusing e-scrap materials through circular economy approaches such as recycling represents an opportunity to extend the useful life of critical materials and reduce the adverse effects of wasted e-scrap.

Prize Goals

- This prize focuses on innovative approaches, processes, or technologies in service of optimizing and implementing critical material separation and recovery from e-scrap.

- The prize is designed to stimulate circular supply chains in domestic manufacturing of critical materials as well as identifying, advancing, and testing innovative technologies and approaches by increasing awareness of opportunities to extend the lifetime of products in the economy through circularity.

- E-SCRAP is interested in innovations that establish or expand the recovery of critical materials along the recycling value chain from end-of-life (EOL) products to reintroduction. Critical material recovery and reintroduction should reduce the life-cycle impacts compared to raw and virgin feedstocks.

E-SCRAP Overview

Prize Overview

- E-SCRAP is a $3.95 million prize, with more than $3 million in cash prizes and $900,000 in technical assistance from national laboratories.

- The prize is designed to stimulate innovative approaches that reduce the costs and environmental impact of critical material recovery from electronic scrap (e-scrap).

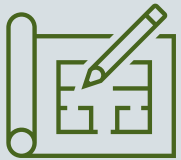
3 Phases: Incubate, Prototype, and Demonstrate

Phase 1: Incubate

Competitors will identify innovations that have the potential to substantially increase the amount of recovered critical materials from electronic waste and used in U.S. manufacturing.

Phase 2: Prototype

Competitors will prototype their innovation and begin collecting and/or generating data that can be used to optimize technoeconomic strategy and life cycle impacts between partners along the recycling value chain.



Phase 3: Demonstrate

Competitors will begin implementing their innovation and identify how it will scale.

$3.95 Million in Prizes

Prize Phase	Duration	Winners	Awards
Phase 1: Incubate	6 months	Up to 10	$50,000 in cash and up to $30,000 of analysis consulting to use in Phase 2
Phase 2: Prototype	9 months	Up to 5	$150,000 in cash and up to $120,000 in analysis technical support to use in Phase 3
Phase 3: Demonstrate	12 months	Up to 3	$600,000 in cash

Competitors have the opportunity to each win up to $800,000 in cash and $150,000 in national laboratory analysis consultation and technical assistance.

Between Phase 1 and Phase 2: Analysis Technical Assistance

In addition to cash prizes, **winners will be able to access support from national laboratories for analysis** such as life cycle analysis (LCA) or techno-economic analysis (TEA) to help accelerate their innovation development and maximize environmental and economic benefits.

- LCA is a methodology for assessing the environmental impacts associated with the entire life cycle of a product or process.
- TEA is a method for evaluating the economic performance of a technology, allowing analysis to objectively weigh benefits against costs.

Areas of Interest

- E-SCRAP is interested in innovations that enhance the recovery of critical materials along the recycling value chain from end-of-life (EOL) products to reintroduction.

- Innovations of interest are those that **optimize** and **implement critical material separation** and **recovery from electronics scrap**.

Areas NOT of Interest

- Separation or recovery of materials from batteries unless paired with the recovery of critical materials from other electronic devices.
- Research and development efforts that have not yet been proved at bench scale.

See further examples of Areas of Interest (Section 1.3) and Areas Not of Interest (Section 1.4) in the Official Rules.

Who Can Participate?

- E-SCRAP is open to:
  - Individuals/teams of individuals
  - Private entities (for-profits and nonprofits)
  - Nonfederal government entities (states, counties, tribes, municipalities, and academic institutions.

- Full eligibility can be found in the Official Rules.

Phase 1: Incubate – What You Need to Know

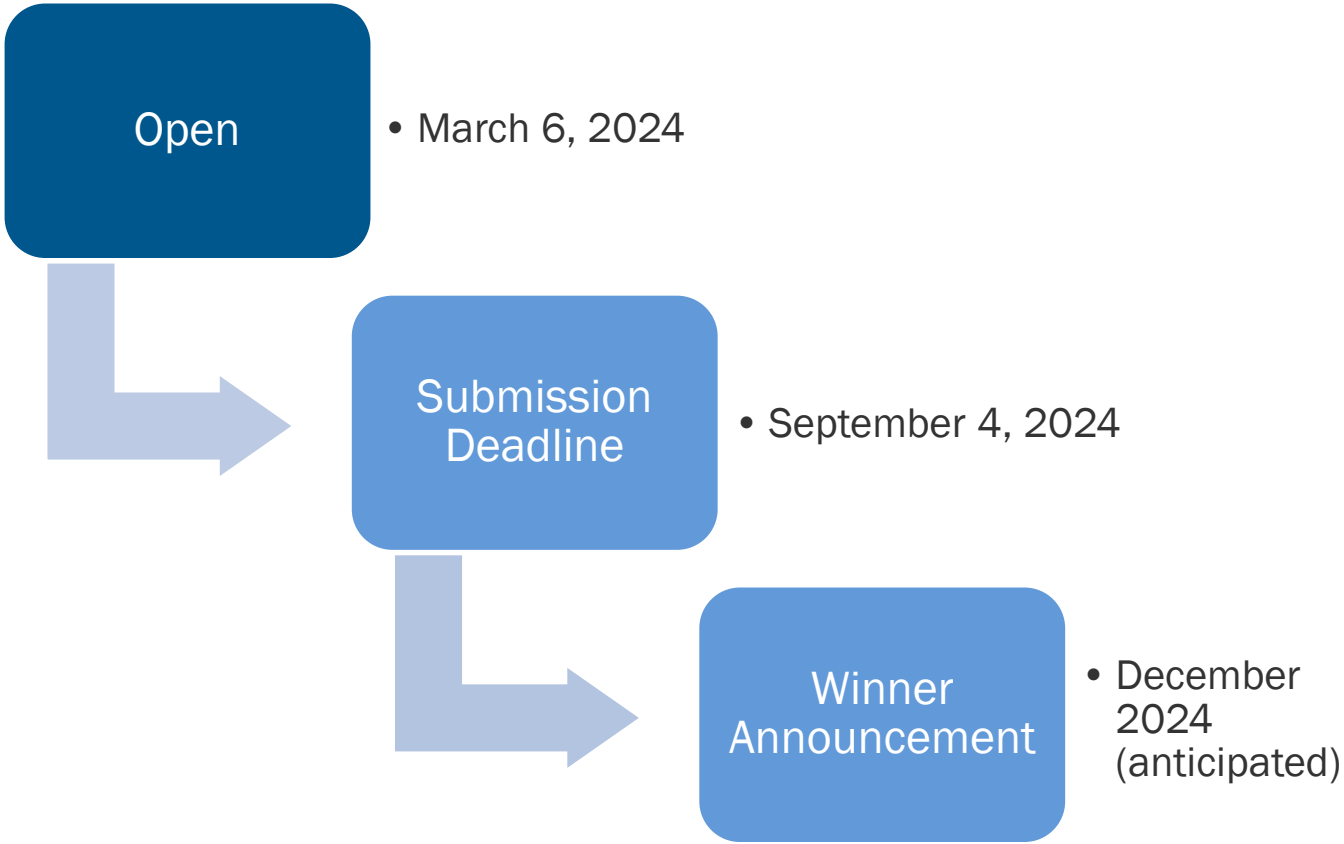
Phase 1: Incubate Overview

- Phase 1: Incubate is the first in this three-phase prize and offers a total of **$500,000** in cash and **$300,000** in national lab analysis consultation.

- Phase 1: Incubate will focus on three key areas:
  - **Opportunity and Innovation Identification**: Identify and describe what innovations are needed and what impact they will have on recovered critical materials from e-scrap.
  - **Plan Development**: Develop a plan to validate and optimize the benefits of the innovation, including how it will be integrated into the recycling value chain.
  - **Stakeholder Representation and Connectivity**: Identify partners in the recycling value chain that will provide inputs (upstream) or handle outputs (downstream) from the innovation's process or technology.

Phase 1: Incubate Prizes
• Up to 10 winners • $500,000 in total cash prizes • $300,000 in analysis consultation • Each winner receives a cash prize of $50,000 and up to $30,000 in analysis consultation from a national lab.

Phase 1: Incubate Timeline



What to Submit for Phase 1: Incubate

1

Cover Page
Not public.
Not scored.

2

90-Second Online Video
Public.
Not scored.

3

Submission Summary Slide
Public.
Not scored.

4

Analysis Support Work Slide
Not public.
Not scored.

5

Narrative
Not public.
Scored.

6

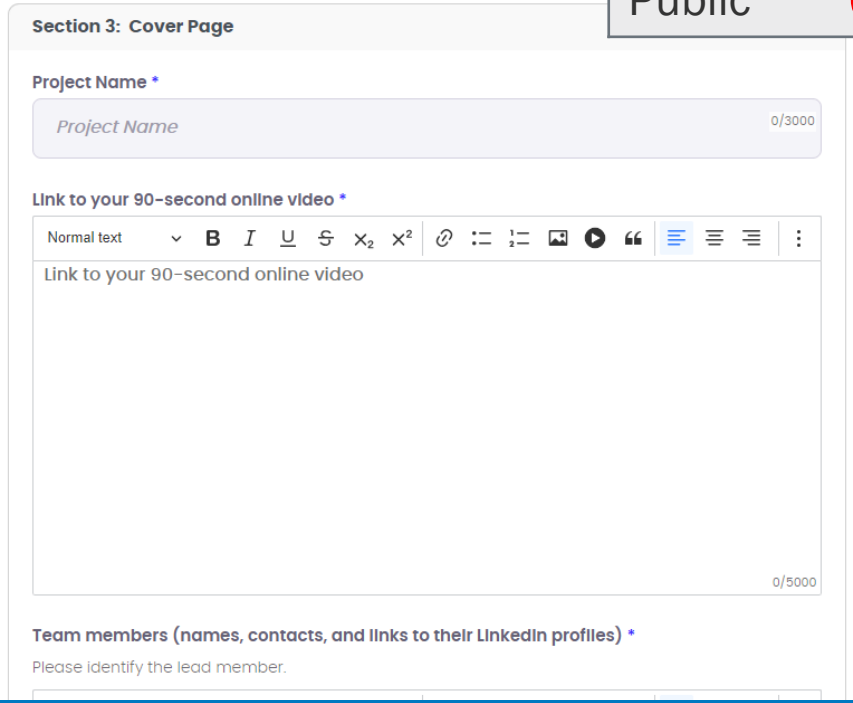
Letters of Support (Optional)
Not public.
Not scored.

Cover Page

Required	✓
Scored	✗
Public	✗

List basic information about your submission:

- Project name
- Link to your 90-second online video
- Team members (names, contacts, and links to their LinkedIn profiles)
- Your city, state, and nine-digit zip code
- Website (if applicable).



To be completed via HeroX

90-Second Online Video

Required	✓
Scored	✗
Public	✓

The video should answer the question: **What is your innovation?**

- Suggested content you provide includes:
  - The opportunity
  - Your solution and why it is transformative
  - Who you are and why you will be successful.

- Post your *publicly accessible*, 90-second video online (e.g., YouTube).

TIP

Focus on the **required content**, not the production quality

Submission Summary Slide

Required	✓
Scored	✗
Public	✓

- The summary slide should be a PowerPoint slide submitted as a PDF. It will be made public.
- Make your own public-facing, one-slide submission summary that contains technically specific details but can be understood by most people.
- There is no template.

Analysis Support Work Slide

Required	✓
Scored	✗
Public	✗

The analysis support work slide should be a PowerPoint slide submitted as a PDF.

It should:

- Briefly describe any analysis, such as LCA or TEA, you have already done.
- Describe how the technical support and consultation for analysis from the national labs will help you deepen your insights into the recycling value chain opportunity and advance your innovation.
- State any preference of which lab (Argonne, INL, LBL, NREL, ORNL, and PNNL) you would like to provide analysis support and the reason for the preference.

The purpose of the Analysis Support Work Slide is to facilitate and match winning teams with the appropriate national laboratory analysis consulting during Phase 2.

Narrative

Required	✓
Scored	✓
Public	✗

Answer each of the four questions:

1. **Innovation**
   - What is your innovation and why will it be impactful?
2. **Value Chain Insight and Opportunity**
   - How does your innovation integrate into the recycling value chain?
3. **Accomplishments and Team**
   - Does your team have the knowledge and experience to be successful? What have you accomplished to date?
4. **Plan**
   - What is your plan to implement the innovation?

TIP

- ✓ Remember your audience
- ✓ Be specific and concise
- ✓ Pay attention to the word count

2,500 word **maximum** with up to 5 supporting images, figures, or graphs.

Template available: https://www.herox.com/ESCRAP-Prize/resource/1688

Letters of Support (Optional)

Required	✗
Scored	✗
Public	✗

- Competitors may also attach one-page letters of support or intent from other relevant entities (e.g., potential users/partners of the proposed innovation).
- Letters of support from partners or others that are critical to the success of their proposed solution will likely increase their score.
  - General letters of support from parties that are not critical to the execution of a competitor's solution will likely not factor into their score.
- A letter of support must not exceed one page. All letters must be combined into a single PDF document.

How to Read the Scoring Rubric

Topic and Percent of Score	Suggested Content to Include	What the Score Will Be Based On
Question 2: Value Chain Insight and Opportunity How does your innovation integrate into the recycling value chain? This section is 25% weight of your total score.	• Explain why the opportunity has not yet been realized and why now is the right time to address it. • Detail how your innovation enables the optimization and/or integration of critical material separation technologies into the complete recycling value chain, particularly between end-of-life and reintroduction phases. Explain the ripple effects and impacts on other stakeholders within the recycling value chain due to your innovation, emphasizing environmental and economic viability improvements in the supply chain. • Provide details on anticipated challenges to successfully realizing the recycling value chain opportunity and how this innovation can overcome these challenges.	• The competitor demonstrates an understanding of the opportunity, why it has not yet been realized, and why now is the right time to address it. • The competitor identifies and clearly explains an opportunity to expand capacity for critical materials recovered from e-scrap that, if realized, will deliver substantial environmental and economic benefits. • The competitor demonstrates insight into the full recycling value chain (waste stream, processes needed, end markets) and provides estimates of expected impacts based on reasonable assumptions.
Question to address. Weight % of this section on your total score.	On the left-hand side is suggested content you could provide to address the judging criteria.	On the right-hand side are the judging criteria that reviewers will use to score your submission.

Phase 1: Incubate Submission Scoring Overview

- Scoring
  - A panel of expert reviewers will read, score, and comment on each submission.
  - Expert reviewers will evaluate your submission by assigning a single score for each scored submission section, based on their overall agreement or disagreement with a series of statements.

0	1	2	3	4	5
Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree

Phase 1: Incubate Submission Scoring Overview

- The final score from an individual reviewer for a submission package will be calculated based on the weighting shown.

Question	Weight (%)
Narrative Question 1 – Innovation	25
Narrative Question 2 – Value Chain Insight and Opportunity	25
Narrative Question 3 – Team and accomplishments	20
Narrative Question 4 – Plan	20
Reviewer Recommendation	10

- All reviewer scores will then be averaged for a final reviewer score for the submission package.
- DOE is the final judge and will make selections based on reviewer scores and comments, and program policy factors.
- **Interviews:** The Prize Administrator may decide to hold a short virtual or in-person interview with a subset of the teams prior to the announcement of winners to clarify any questions the Prize Administrator may have. Attending interviews is not required, and interviews are not an indication of winning.

A full list of Program Policy Factors can be found on page 40 of the Official Rules

HeroX Live Demo

American-Made Challenges

702 Share Following (20)

E-SCRAP Prize

Designed to stimulate innovative approaches that reduce the costs and environmental impact of critical material recovery from e-scrap.

Energy, Environment & Resources | Government

Stage: **Enter**

Prize: **$3,950,000**

SOLVE THIS CHALLENGE

Follow along at: https://www.herox.com/ESCRAP-Prize

Phases 2 and 3 – What to Expect

Phase 2: Prototype Overview

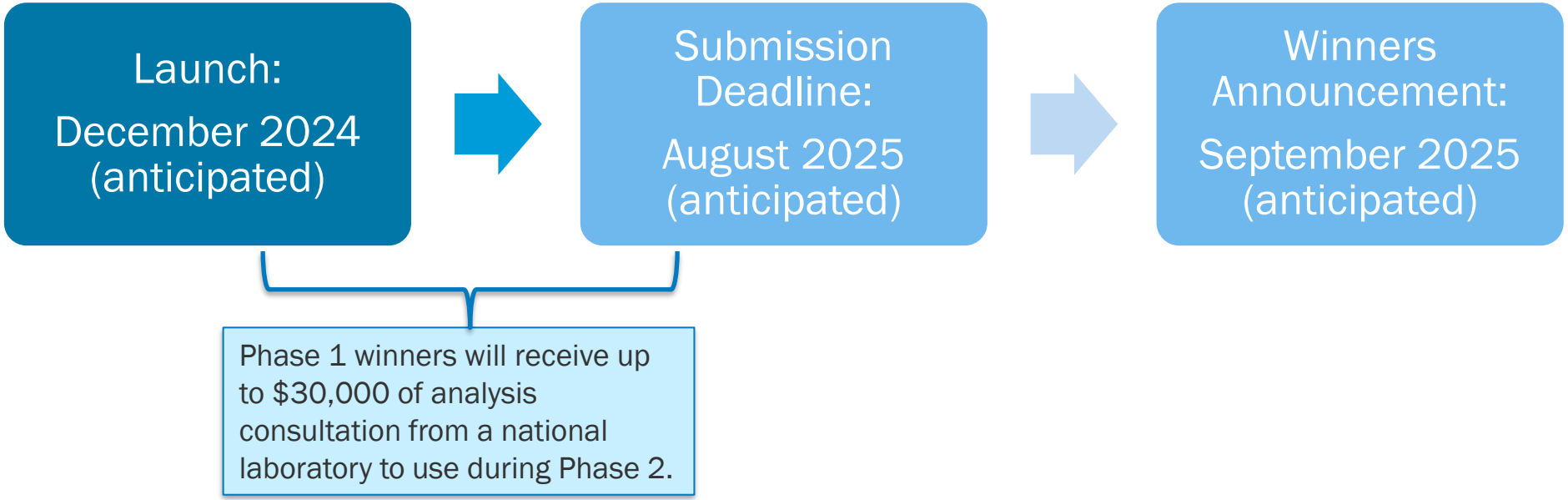
- Phase 2: Prototype will offer a total of $750,000 in cash and up to $600,000 analysis technical assistance
- Any competitor, including winners and nonwinners from Phase 1: Incubate as well as new competitors, can compete in Phase 2: Prototype

- Phase 2: Prototype will focus on three key areas:
  - **Deepen Insight:** Leverage national laboratory expert analysis consultation and/or other resources to understand and evaluate the environmental, economic, and supply chain benefits of the innovation and e-scrap recycling value chain.
  - **Validate Innovation:** Advance innovation toward implementation in a recycling value chain by proving the technology or process reliability recovers high quality critical materials in a relevant recycling value chain with improved environmental and/or economic benefits over the status quo.
  - **Share Information:** Cooperate with entities upstream and downstream to optimize processes for economic and environmental efficiency by sharing technoeconomic benefits and tradeoffs to incorporating critical materials recovery into the e-scrap recovery recycling value chain.

Phase 2: Prototype Prizes

- Up to 5 winners
- $750,000 in total cash prizes
- $600,000 in analysis technical assistance
- Each winner receives a cash prize of $150,000 and up to $120,000 in analysis technical assistance from a national lab.

Phase 2: Prototype Timeline



What to Submit for Phase 2: Prototype

Cover Page
Not public.
Not scored.

90-Second Online Video
Public.
Not scored.

Submission Summary Slide
Public.
Not scored.

Analysis Support Work Slide
Not public.
Not scored.

Narrative
Not public.
Scored.

Phase 3: Demonstrate Overview

- Phase 3: Demonstrate will offer a total of $1.8 million in cash
- Only winners of Phase 2: Prototype can compete in Phase 3: Demonstrate

- Phase 3: Demonstrate will focus on three key areas:
  - **Plan Execution:** Demonstrate that you are advancing your innovation and achieving the metrics for success.
  - **Partnership Integration:** Establish information and data feedback loops to optimize material flow from upstream and to downstream processes.
  - **Post Contest Planning:** Develop a long-term plan to implement and scale your innovation into the recycling value chain.

Phase 3: Demonstrate Prizes
• Up to 3 winners • $1.8 million in total cash prizes • Each winner receives a cash prize of $600,000

Phase 3: Demonstrate Timeline

What to Submit for Phase 3: Demonstrate

1

Cover Page
Not public.
Not scored.

2

90-Second Online Video
Public.
Not scored.

3

Submission Summary Slide
Public.
Not scored.

4

Committed Partnership or Support Letter
Not public.
Required.

5

Narrative
Not public.
Scored.

6

Participation in LCA Commons and Material Reuse Clearing House
Not public.
Required.

Get Started Today!

Resources – Power Connectors

Competitors who are participating in Phase 1 will be able to access support from ADL Ventures and yet2, American-Made Power Connectors:

- Ask questions about the prize
- Receive feedback on submission materials
- Receive general support for the prize.

Find more information about Power Connectors on HeroX.

ADL

- Contact Frank Yang at frank@adlventures.com

Yet2

- Contact Hongyi Zhang at hzhang@yet2.com

Partnerships

- DOE has invested in the research and development of innovative technologies that can recover and recycle metals from electronic scrap. To advance these technologies toward commercial application, they must be optimized and integrated within the e-scrap value chain.
- By coordinating with partners upstream to understand composition, concentration, and flow rate can help tailor and improve the metal recovery process and prove out the technoeconomic and life cycle benefits of the technologies.
- By coordinating with partners downstream can help to understand material benchmarks and standards that must be met or overcome to validate the recovered material for reintroduction into the marketplace.

Resources - Partnerships

- Partnerships enable organizations to combine their resources, including technology, infrastructure, and expertise. By sharing these resources, partners can optimize and integrate innovative recovery processes, streamline their operations, and reduce redundant efforts
- Check out the teaming information on the Resources tab
- Connect with other interested competitors to optimize and integrate your innovation into the value chain
- Join us for the upcoming teaming event on July 16 at 1:00 pm ET

Resources – Previous Work

- DOE has invested in the research, development, and demonstration of technologies to recovery materials from electronic scrap for nearly a decade and continues to invest moving forward.

Advanced Materials and Manufacturing Technologies Office (AMMTO)

- https://www.energy.gov/eere/ammto/ammto-project-database

Critical Materials Innovation Hub (CMI)

- https://www.ameslab.gov/cmi/building-circular-economy

REMADE Manufacturing USA Institute

- https://remadeinstitute.org/technology/major-initiatives/recovery-recycling-of-e-scrap/

Manufacturing and Energy Supply Chain Office (MESC) and Vehicle Technologies Office (VTO)

- Bipartisan Infrastructure Law – Section 40207 selections: https://www.energy.gov/eere/vehicles/funding-selections-bipartisan-infrastructure-law-battery-recycling-reprocessing-and

Get Started Today!

- Get signed up:
  - Follow the challenge on HeroX.
- Submit your Phase 1: Incubate Submission:
  - Read the Official Rules
  - Submit by **September 4, 2024, at 5 p.m. ET.**
- Have additional questions?
  - Post your questions on the HeroX Forum.
  - Utilize a Power Connector for support
  - Contact us at escrap.prize@nrel.gov

Questions?

To Ask a Question:
Select the Q&A button at the bottom of your screen and type in your question.

Questions may be answered live, but all questions will be answered in writing on HeroX.

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Thank You!