Value Recovery from Used Electronics, Phase 2

Co-Leaders:  
Carol Handwerker (Purdue)  
William Olson (Seagate)

Call for Participation Webinar  
September 6, 2017

Link to Session 1 Webinar (good for six months following webinar date):  
https://inemi.webex.com/inemi/lsr.php?RCID=5d46d9992f60436ebda753b5d1dded9a
Value Recovery from Used Electronics

• Introduction of Co-Chairs
  – Bill Olson, Seagate
  – Carol Handwerker, Purdue

• Circular Economy, Value Recovery and the path forward
  – HDD and beyond

• Phase 2 SOW Review

Note: All phones will be on mute during the presentation. Please type questions into the chat window.
Value Recovery: Path Forward

• Develop a voluntary, community-based solution involving adaptive governance systems to self-manage common pool resources (E. Ostrom - 2009 Nobel Prize in Economics)
  – Legislation is not practical or advantageous
  – Path forward is through a multi-stakeholder collaboration that articulates a vision and develops scenarios for enhancing value recovery of electronics and metal resources.

• First challenge was to identify a focus and common goals that can get us started – attract team members and key stakeholders

Phase 1 - Value Recovery for Hard Disk Drives (complete)  
Phase 2 – Value Recovery from Used Electronics (call for participation)
Value Recovery: Hard Disk Drives

*Momentum within the community – Seagate President*
‘Hard drives from hard drives”

Seagate and the Critical Materials Institute (CMI) have been examining various approaches to value recovery:

• new technologies for removing and reusing magnets from HDDs

• economic, environmental, and logistics analyses to examine the viability of various scenarios for used HDDs and other used electronics
A Circular Economy

Ellen MacArthur Foundation
A Circular Economy

PRINCIPLE

1

Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows ReSOLVE levers: regenerate, virtualise, exchange

PRINCIPLE

2

Optimise resource yields by circulating products, components and materials in use at the highest utility at all times in both technical and biological cycles ReSOLVE levers: regenerate, share, optimise, loop

PRINCIPLE

3

Foster system effectiveness by revealing and designing out negative externalities All ReSOLVE levers

Ellen MacArthur Foundation

Minimise systematic leakage and negative externalities
New Pathways for Value Recovery: HDD

In order to unlock value recovery we must intentionally design for that outcome.

The intent is to extend the working life of HDD’s by all possible means.

Open up New markets and channels for used electronics.

OEM’s must design the HDD for maximum value recovery.
Value Recovery beyond the HDD

• Used HDD’s are just one type of consumer electronic product. The approach developed in Phase 1 can be applied to all forms.

• The proposed path requires a fundamentally new approach to consumer electronics design and life cycle management.

• Implement the Ostrom framework to maximize the value of used equipment through Circular Economy based life cycle management.
Phase 2 – SOW Review
Purpose

• This fast-turn project will focus on collaboration in hard disk drive design, reuse, remanufacturing, and materials and component recovery that enables a robust, sustainable circular supply economy for hard disk drives.

• From the users’ viewpoint, to be effective, the rationales, pathways and incentives must be compelling enough to convince users to channel their products into the value recovery stream.

• For HDDs in particular, data security concerns (and the legal and corporate liabilities associated with the release of confidential and sensitive data) frequently lead HDD users in the US to shred their HDDs, even if they are fully functional.

• One of the goals of the project is to engage with HDD users and all those in the value recovery supply chain to assess users’ data security concerns and obligations and best practices required to avoid shredding.

• Users, manufacturers, service providers, and parts manufacturers, and for others critical to value recovery of HDD (identified in Phase 1), must work together to analyze the capabilities of existing and new technologies and identify the gaps needed to “complete the circle”.

• The purpose of this project will be to take the next steps in developing a circular economy for HDDs.
Objectives/Goals

- Identify/Develop Criteria for encouraging the reuse/resale of used, functional HDDs for different user types that have different HDD use profiles and data security concerns. Starting with the NIST decision making guidelines, data sanitization options will be evaluated, including using firmware-based remanufacturing, physical data wiping, replacing the encryption key for self-encrypting drives (SED), as well as physical destruction/shredding, and the necessary conditions for choosing specific options will be analyzed. A set of examples will be used to demonstrate how these can be implemented for different user groups.

- Identify/Develop Criteria for enabling reuse of HDD components – from HDD Manufacturers’ point of view (design, materials, processes, economics, supply chain, corporate strategy for next generation devices and technologies), recycling/recovery supply chain point of view (collection efficiency, logistics, and economics), and HDD user/owners’ point of view (risks, incentives).

- Identify/Develop Criteria for enabling reuse of magnets in non-HDD applications, including economics, technology availability, and secondary market dynamics.

- Benchmarking current reuse and recovery processes (quantitative: yield, efficiencies, economics, product availability and flows, collection efficiencies and pathways) and compare with emerging technologies and processes.

- Identify Critical Leverage points affecting HDD value recovery/reuse,
## IS/IS Not

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<thead>
<tr>
<th>This Project <strong>IS:</strong></th>
<th>This Project <strong>IS NOT:</strong></th>
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<tbody>
<tr>
<td>Focusing on value recovery of hard disk drives (HDDs)</td>
<td>Focusing on other IT electronics, except in so far as they contain HDDs</td>
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<td>Focusing on design guidelines and decision making criteria for HDD reuse, parts recovery, and metals recovery and their application</td>
<td>Developing Standards or Certifications</td>
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<td>Building supply chains for high volume value recovery of HDDs</td>
<td>Limited to existing pathways or stakeholder interactions</td>
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<td>Involving companies and stakeholders from across the electronics industry, not just HDD manufacturers or a limited number of stakeholder types</td>
<td>Repeat existing work</td>
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<td>Investigating supply chain economic considerations to develop circular use of materials, components, products</td>
<td>Shredding and landfilling or Waste to Energy at End of Life</td>
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<td>Identifying new materials recycling technologies being developed that might enable greater value recovery</td>
<td>Developing new metals recycling processes or end processes.</td>
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<td>Performing product and supply chain analyses to determine where and how HDD are used and discarded by specific user groups and applying the decision points and agents/actors identified in Phase 1 to create different value recovery systems, pathways, and partnership</td>
<td>Developing commercialization plans for or promoting a particular recovery technology</td>
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<td>Engaging with R&amp;D community to discuss technology gaps for sustainable value recovery from end-of-use HDDs</td>
<td>Being prescriptive</td>
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<td>Testing the Ostrom socio-ecological framework for creating self-organizing, sustainable communities for HDDs</td>
<td>Creating new tools or assessment methods</td>
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<td>Showing options for value recovery to manufacturers, electronic recyclers and other economic and societal actors in the HDD supply chain</td>
<td>Judging effectiveness</td>
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<td>End outputs: Public report; Implementation plans - iNEMI member-only recommendations for next steps (Phase 3+ or other)</td>
<td>Developing OEM-specific product design criteria</td>
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Intended Outcomes

• the creation of new value recovery pathways for end-of-use HDDs,
• the strengthening of existing pathways, in effectiveness, economic viability, and yield,
• the identification of ways to change decision making processes and remove barriers to promote HDD and HDD component reuse,
• the establishment of new, stronger relationships among stakeholders with shared goals for increasing value recovery from EoU HDDs.

The new value recovery pathways may include redesign of HDDs so that components may be reused, better education of and OEM-follow-through with users to enable firmware-based remanufacturing or encryption key resets to avoid the need for shredding, innovative technologies that reduce the cost for component recovery and materials recycling.
Long Term Outlook

• This iNEMI sponsored project proposes a highly collaborative prototype system for value recovery based on the Ostrom Framework for sustainable, self-management of common pool resources.

• The project would provide a case study for understanding what the term “best practices” mean for the stakeholders to create a circular economy, how trusted relationships can be built, and how information sharing can help the stakeholders identify new opportunities for EoU management of HDDs.
### Task List and Timeline

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**Task 1**: Identify Criteria for Enabling Reuse of used, functioning HDDs and of components from used, non-functioning HDDs  
**Task 2**: Identify Criteria for Enabling Reuse of HDD components in HDD applications – both direct and indirect for metal components, disks, magnetics, motors, head, PWBs etc.  
**Task 3**: Identify Criteria for Enabling Reuse of magnets in non-HDD applications  
**Task 4**: Develop economic and logistics estimates for cases studies identified in Tasks 1-3.  
**Task 5**: Summarize, Review Design principles for reuse in HDD and non-HDD applications  
**Task 6**: Benchmark current reuse and recovery (direct, indirect) with stakeholder input  
**Task 7**: Identify Leverage Points  
**Task 8**: Identify/Map the supply chain and identify key gaps for developing a circular economy including each value recovery pathway for HDDs  
**Task 9**: Socialize and publish findings
Partners for iNEMI Project

- Seagate
- Purdue
- Cisco
- Teleplan

- Geodis
- Google
- White Canyon

**Seeking additional members from organizations such as**
Western Digital, Toshiba, Facebook, CMI, Amazon, Data Centers, Alcoa, Alcan, Umicore, Cascade, ERI, Urban Mining, Wistron, Dell, IBM, ORNL, Celestica, Mycronic, Sims, NIST, Consumer and Electronic producers.

We welcome your suggestions for others to invite.
Schedule

• Call for Participation Webinars:
  – Wednesday, September 6th 9 am – 10 am ET
  – Wednesday, September 6th 9 pm – 10 pm ET

• Initial Sign up ends October 6th

• Project Kickoff Plan
  – Wednesday, October 18, 11 AM – Noon ET

• Duration (Approximately 12 months)
  – Start in October 2017 and present findings by first week of October 2018
How to Join

• Go to the project website and download the forms that apply to you:
  http://community.inemi.org/value_recovery_2

• iNEMI Members:
  – Download the Project Statement
  – sign the Project Statement and return to iNEMI

• Non-members:
  – Complete and sign the Memorandum of Understanding (MOU) document
  – Fax the MOU to +1 (703) 834-2735 or scan and email to infohelp@inemi.org
  – iNEMI will then invoice you for the Fast Turnaround Project Membership fee of $5,000.00