

Sustainable Electronics Campus Consortium—U of I Urbana campus

Preliminary Meeting, ISTC, October 2, 2013

Agenda

- Introductions
- What is the Sustainable Electronics Initiative (SEI)?
- What is the objective of forming this consortium?
- Participant interests based on RSVP form
- Overview of what SEI & others are doing + Possible future activities & goals for this consortium related to those interests
- Lunch ☺
- Discuss value of proposed goals, decide on priority activities. Discuss group structure, frequency of meetings, and possible date for next meeting.

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What is SEI?

Began in 2009 with a concept paper after a focus group was held at UIUC. *“A need exists for a Consortium dedicated to the development and implementation of a more sustainable system for designing, producing and handling electronic devices. Specific elements of such a Consortium would include programs for research, education, data management and technical assistance.”*

http://www.sustainelectronics.illinois.edu/concept_paper.pdf

Mission: The Sustainable Electronics Initiative (SEI) at the Illinois Sustainable Technology Center (ISTC) is dedicated to the development and implementation of a more sustainable system for designing, producing, using, reusing, and recycling electronic devices.

Two-pronged Approach—Research & Education

- Conducts and sponsors research
- Integrates principles of sustainability into curricula & educational experiences

Why form a campus consortium?

- This campus is home to one of the top engineering colleges in the country; \$583,754,000 was spent on R&D in science & engineering in 2012; all classrooms have wireless access
- This is the birthplace of notable technological innovations
 - e.g. ILLIAC, Mosaic Web browser, LED, plasma displays, etc....even fictional innovations like HAL from 2001: A Space Odyssey
- Electronics represent one of the fastest growing waste streams in the US and globally. In 2009 438 million new consumer electronics were sold in the US & 2.37 short tons of electronics were ready for end-of-life management; only ~25% of those were collected for recycling. (*US EPA: Electronics Waste Management in the United States through 2009*)
- Electronics manufacturing is energy/resource intensive, and materials used include rare and precious materials, as well as many potentially hazardous substances.

Why form a campus consortium?

- As a major public university we have a duty to address these issues, and lead by example. This is in line with other campus sustainability efforts, such as the Illinois Climate Action Plan. Named to Princeton's Green Honor Roll.
- If SEI is going to promote research & education in this field, our University should practice what we preach.

To “green up our act” related to electronics as much as possible on campus by:

- Bringing together individuals interested in research, education, and/or operations and policy related to sustainable electronics
- Fostering greater awareness of relevant work being done on campus
- Facilitating collaborations.

Participant Interests

Based on 14 RSVP forms; R= research; E= education; O= operations

- Conducting research on greener materials and greener electronic product design: **1 R**
- Conducting research on electronics recycling, reusing, or managing electronic scrap (“ewaste”): **4 R**
- Conducting research on electronics consumption patterns or consumer attitudes, knowledge, etc.: **2 R**
- Funding opportunities for research or campus projects: **3 R, E, O**
- **How sustainable electronics relate to a class I’m teaching and/or other relevant classes on campus: 7 E**
- Special projects and other student opportunities related to sustainable electronics: **5 R, E, O**
- Campus purchasing policies related to electronics: **5 O**
- **Campus policies related to end-of-life management of electronics: 8 O**
- Learning more about the environmental and social impacts of electronic products in general: **6 R, E, O**
- **Campus/community collaborations related to sustainable electronics: 8 R, E, O**
- Other: Sharing information about similar efforts at other universities, and sharing UIUC efforts in this area with the rest of the world.: **1 R, E, O**

Research: SEI Projects

PCRR Waste Stream Analysis

SEI technical report, March 2010:

<http://www.sustainelectronics.illinois.edu/Publications/SEI%20TR-001.pdf>.

Deborah Thurston, Harrison Kim, and students analyzed e-waste stream at a computer refurbishing company, the type and extent of product variability, and discussed implications for design for sustainability.

Reducing E-waste Through Purchasing Decisions

- Sponsored research conducted by the Delta Institute & the Green Electronics Council.
- Identified barriers & opportunities for purchasing agents to include end-of-life decisions in purchasing & asset managers to practice responsible recycling



Research: SEI Projects



New Life for Laptops

- Course offered in Spring 2012 at UIUC with funding from Dell, Inc.
- Multidisciplinary teams of students identified ways to reuse technology from laptops with hard drives removed for data security; extend useful life of valuable materials prior to recycling
- Professors: William Bullock (Industrial Design), Hong Yuan (Business Administration), Cliff Shin (Industrial Design), and Brian Lilly (Engineering).
- Guidance and feedback from John Pflueger, Principal Environmental Strategist, and Mike Watson, Director of Compliance, from Dell, Inc.

DEE Lab (Research and Education)

- William Bullock directs; focus on sustainable product design
- Course sponsored by industry or government clients; team taught
- Multidisciplinary teams of advanced students work on real-world problems
- Focus customer-driven product development instruction and research
- Link design, business, and technology resources
- Technical Advisors – U of I specialists and industry experts

Research: SEI Projects



Assessment of Electronics Collection/Recycling in IL Counties

- Sponsored research being conducted by Champaign County Regional Planning Commission to determine status quo of electronics recycling opportunities for citizens in each of IL's 102 counties.
- This data will help identify regions where citizens recycling needs are not being met, and strategies to improve enforcement and implementation of IL's electronics recycling legislation.

Cell Phone Plastics Characterization & Feasibility Study

- Feasibility study conducted by ISTC scientists for an electronics asset recovery firm to determine suitable routes for recycling, reuse, or energy recovery for plastic materials collected from cell phones.
- Identified firms potentially willing to accept the mixed plastics for recycling, evaluated plastic separation methods using solvents, & assessed pyrolysis as a possible management strategy. Solvent separation was deemed preferable; currently working to identify more benign solvents.



Research: Other groups

- John Rogers lab—transient electronics, self-assembling materials
- Jennifer Lewis and particle-free silver inks
- Other Nanotech—implications for recyclability, environmental impacts
- Energy efficiency, new types of batteries
- 3-D printing—beneficial social impacts; what are the potential environmental impacts?
- Novel uses for electronics that could have sustainability implications—e.g. Cunningham research group and cradle that turns smartphone into handheld biosensor
- And probably many other groups and research projects too numerous to mention....

Research: Possible activities/goals

- **ISTC sponsored research program**—HWRF. Next RFP could include sustainable electronics issues as a focus, possibly mention specific “hot topics” (e.g. CRT glass recycling; assessment of purchasing policies across different campus units, alternative materials for manufacturing, etc.)
- **Possible sustainable electronics fellowship program** with support from HWRF??
- **NSF Science, Engineering, and Education for Sustainability (SEES) Fellows** (*Research and Education*):
http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504673&org=GEO&from=home. Theoretically, proposal deadline is 11/26.
- **Collaboratively pursue external research grants**
- **CRT glass challenge:** CEA, ISRI, InnoCentive:
<https://www.innocentive.com/ar/challenge/9933317>
- University membership in **iNEMI (International Electronics Manufacturing Initiative)**? Consortium of manufacturers, suppliers, associations, government agencies and universities. R&D foci on miniaturization, environment, and medical electronics. <http://www.inemi.org/about-us>
- **Graduate college Focal Point** (*Research and Education*):
<http://www.grad.illinois.edu/focal-point-feature> Submissions due in spring.

Education: SEI Projects



International Sustainable Electronics Competition www.ewaste.illinois.edu

- Grew out of UIUC class on e-waste issues in 2009
- Became annual international event in 2010 with online submissions
- Open to current college/university students or recent graduates from any discipline
- Submissions: brief YouTube video, project description, bibliography, & proof of eligibility
- Individuals or teams of up to 5 members
- Two categories: “Product” & “Non-Product”
- Expert jurors
- Three winning projects in each category—6 total
- 1st prize \$3000, 2nd \$2000, & 3rd \$1000
- Corporate and individual sponsors
- Professors often use competition as a class project
- **Registration is FREE and currently open; submissions are due November 1, 2013.** Winners will be announced December 5.



Education: SEI Projects



Course Development

- Will initially be taught as a special topics course; planned for Spring 2014
- Collaboration with Technology Entrepreneur Center/Engineering Online
- Lectures and activities focused around all life cycle phases of electronics (design, manufacture, distribution/consumption, disposal/recovery)
- Graduate level for online course; undergraduate face-to-face on-site option for Innovation LLC
- Future: possible connections to existing online degree programs and/or a campus-wide sustainability minor (in development).

Integration into Existing Curricula

- “Resources” section of SEI web site will focus on resources for educators
- Developing guides & activities for incorporating SE concepts into various disciplines—want to make it easier to use electronics as a framework for teaching about sustainability

Symposia—see <http://www.sustainelectronics.illinois.edu/symposia/> (*Research and Education*)

Education: SEI Projects



iFixit Technical Manuals

- Interested in having UIUC students work on manuals; see www.ifixit.com.
- Could potentially be a final project for students in course mentioned previously, integrated into other existing courses or RSOs, and/or part of a bigger “computer repair café” project (*Education and Operations*)

Integration into Existing Curricula

- “Resources” section of SEI web site will focus on resources for educators
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- Current seminar class taught by Nancy Holm & John Abelson includes electronics-related webinars.

Student Projects

- Worked with a student on a project for her minor in museum studies
- Other possible projects: prototypes of New Life for Laptops concepts, “WEEE Alma”, etc.

Outreach to K-12 & general public

Education: Other groups

On campus

- Center for Sustainable Environment—integration of sustainability in curricula
- Human Dimensions of Environmental Systems (HDES)
- Energy & Sustainability Engineering Initiative
- Technology Entrepreneur Center
- Living-Learning Communities—Innovation & Sustainability
- Learning in Community (LINC) engineering classes
- Student Sustainability Committee
- Many RSOs (Engineers Without Borders, SECs, etc.)
- School of Earth, Society, & Environment—online sustainability certificate program
- Possible sustainability minor
- GSLIS: Martin Wolske & students lead workshops at Kenwood Elementary. Participants learn about computers and software, disassemble and put them back together. Can also take home computers, which have been donated by local businesses.

Other colleges & universities

- Digital Equality Initiative—Volo & Parkland College; <http://volo.net/equality>
- Purdue/Tuskegee NSF iGERT—Series of 4 courses; participants get certificate in sustainable electronics

Education: Possible activities/goals

- Pursue collaborative effort to bring a “computer repair café” to fruition, with an element of computer donation (*Education and Operations if donations can be made by the University in the future*)
- Work on tying sustainable electronics to existing or proposed certificate and degree programs, as well as existing student opportunities
- CRT glass challenge could be part of a course or student opportunity (*Research and Education*)
- EPA’s People, Planet, Prosperity (P3) competition (*Research and Education*): <http://www.epa.gov/P3/> . Proposed to open October 2013.
- National Collegiate Inventors and Innovation Alliance (NCIIA): Course & Program or Sustainable Vision grants—see <http://nciia.org/grants>. Deadline for both is November 8, 2013. (*Research and Education*)
- SEI symposium in 2014? Focus on education?



a student
design competition
for sustainability

Operations

SEI/ISTC Projects

- 1st Illinois partner in the State Electronics Challenge (SEC; <http://www.stateelectronicschallenge.net/>)
- Zero waste efforts; building waste characterizations
- One of the campus locations for battery collection for recycling

Other Groups/Projects on campus

- Existing end-of-life management procedures incorporate reuse of working electronics on campus, and via CMS auction. Non-working items, or items not sold via auction are responsibly recycled.
- Overall campus sustainability efforts, Illinois Climate Action Plan
- Battery collections
- Housing offers recycling of certain items
- Recyclemania—there is a subset of this geared toward electronics
- Student Sustainability Committee grant program; Food & Waste working group
- CSE fellowships for campus projects—could be potential for focus on electronics-related projects
- Recent interest expressed by students to start electronics collection projects: printer cartridges, cell phones, electronics in general

Operations: Possible activities/goals

- Encourage other campus units or the University as a whole to join State Electronics Challenge. Participation in SEC could contribute to the following 3 items.
- Develop a campus-wide purchasing policy related to electronics
- Develop campus guidelines for operations and maintenance of electronics, including guidelines for equipment refresh cycles
- Consider opportunities to increase reuse of electronics on campus. Explore donation of electronics for reuse, in ways previously mentioned, if state policy on this changes.
- Educate faculty, staff, and students about existing policies and programs (or lack thereof) on campus and in community (Operations and Education)
- Advise students and/or RSOs interested in coordinating their own collection/recycling activities

Group Discussion

- What proposed potential activities/goals should be pursued on campus? Are there other goals that should be considered?
- Should this group break into subgroups around the focus areas of research, education and operations, or meet and work together as a whole?
- How often should this group meet?
- How should information be shared?
- Other issues?