



The ISSST organizing committee would like to thank the generous support of the Green Electronics Council and EPEAT for sponsoring the poster session and the student poster and paper competitions.



FINAL PROGRAM



2011 IEEE
International Symposium on
SUSTAINABLE SYSTEMS & TECHNOLOGY

SPONSORED BY
IEEE COMPUTER SOCIETY
TECHNICAL COMMITTEE ON
SUSTAINABLE SYSTEMS AND TECHNOLOGY



MAY 16 – 18, 2011
CHICAGO, IL



2011 IEEE International Symposium on Sustainable Systems and Technology
May 16-18, 2011, Chicago, IL

Scope and Format

The IEEE Computer Society Technical Committee on Electronics and the Environment welcomes you to Chicago and the IEEE International Symposium on Sustainable Systems and Technology (ISSST).

For the past 18 years, this symposium has attracted representatives from around the world to discuss and present innovative solutions to sustainability challenges related to engineered systems generally, and for the information and communication technology (ICT) sector in particular. The program covers the spectrum of issues for assessing and managing products and services across their life cycle, and the design, management, and policy implications of sustainable engineered systems and technologies.

ISSST provides an excellent opportunity for environmental and business professionals, design and manufacturing engineers, researchers, and government decision-makers interested in advancing practical sustainability solutions in the field to learn about leading edge research and initiatives.

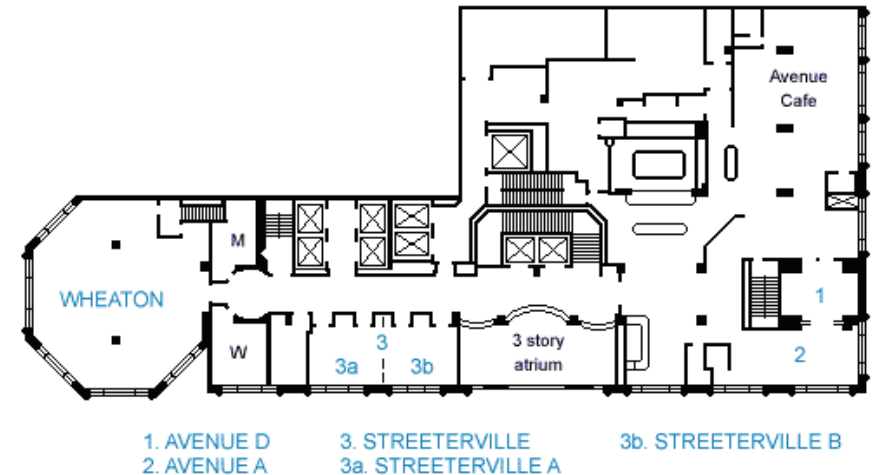
Highlights of the 2011 ISSST program include:

- 18 sessions on a diverse set of topics, from nanotechnology to large-scale infrastructure, authored and presented by an international mix of speakers.
- Keynote address given by the Vice President of the International Electronics Manufacturing Initiative (iNEMI).
- 2 special industry sessions on ‘Uses of ICT technologies in addressing environmental and sustainability challenges’, given by sustainability leaders at prominent ICT companies.

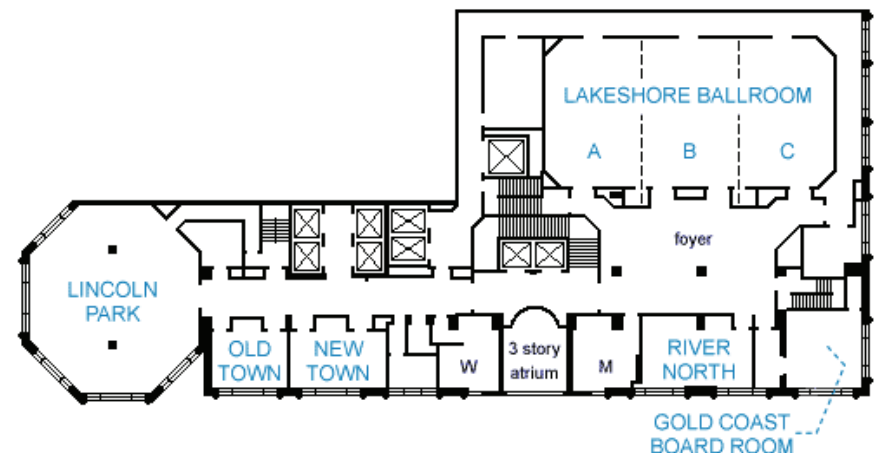


Hilton Suites Chicago Magnificent Mile
Floorplans

Second Floor



Third Floor





PROGRAM SESSIONS

SESSIONS 16-18 | WEDNESDAY, MAY 18, 2011, 10:30am – 12:30pm

SESSION 16: BIOFUELS

Location: Lakeshore A

Capturing uncertainty in GHG savings and carbon payback time of rapeseed oil displacing fossil diesel in Europe

João Malça and Fausto Freire

A Multi-Actor Life Cycle Assessment Approach to Assess the Potential of Next Generation Bio-jet Fuels

Datu Buyung Agusdinata, Fu Zhao, Klein Ileleji and Dan DeLaurentis

Emergy analysis of ethanol production from low-input, high-diversity (LIHD) grasslands on degraded farmland

Robert Urban and Bhavik Bakshi

Environmental performance of palm oil biodiesel – a life-cycle perspective

Érica Geraldes Castanheira and Fausto Freire

Assessment of Bio-Fuel Options for Solid Oxide Fuel Cell-Based Auxiliary Power Units

Jiefeng Lin, Daniel Smith, Callie Babbitt and Thomas Trubold

SESSION 17: ASSESSING SERVICES

Location: Lakeshore B

Greening the Service Industries: A Case Study of a United States Engineering Consulting Firm

Scott Shrake, Amy Landis and Melissa Bilec

Development of common quantitative social impact indicators for ICT services

Kazue Takahashi, Masayuki Tsuda, Minako Hara, Tatsuya Kunioka, Jiro Nakamura, Julien Boisseau, Tokomo Tanaka, Marc Aubree and Ahmed Zeddani

The Carbon Footprint of Watching Television, comparing Digital Terrestrial Television with Video-on-Demand

Jigna Chandaria, Jeff Hunter, and Adrian Williams

Hospital Radiology Department Overhead Energy Estimation

Ashkan Jahromi, Janet Twomey, Amin Esmaeili, Fernando Valenzuela, Bayram Yildirim and Michael Overcash

SESSION 18: POLICY AND SUSTAINABILITY

Location: Lakeshore C

US Toxic Substances Control Act Reform and Information Technology Products

Debra Horn

Geoengineering: A critique

Braden Allenby

Modeling the effects of energy efficiency improvements on life cycle greenhouse gas emissions of products and in determining policy effectiveness

Derrick R. Carlson, H. Scott Matthews, Eric Masanet and Arpad Horvath

Using Non-cooperative Games to Simulate Ethical Tensions in Climate Policy Negotiations

Susan Spierre, Thomas Seager, Evan Selinger and Jathan Sadowski

Using an LCA approach to evaluate green labels

Neethi Rajagopalan, Melissa Bilec and Amy Landis



- A special education session on assessing sustainability knowledge that incorporates direct observations from ISSST presentations and events.
- A free professional skills development session for students and young professionals immediately prior to the conference covering development of research ideas, positioning, and grantwriting.
- A student technical paper contest and poster contest (our largest ever!) to recognize student contributions to the advancement of knowledge on environmental impacts.

The organizers are interested in your views of the conference and the environmental aspects of the industry. Please share your opinions with the organizers and consider volunteering your time and effort to make the 2012 conference equally successful.

We hope you find this event professionally and personally useful. It represents a unique opportunity to bring together all parties in the field to communicate progress and challenges to improve the sustainability of our technology-driven world.

Thomas Seager
Conference Chair

Matthew Eckelman
Program Chair



2011 IEEE International Symposium on Sustainable Systems and Technology

Organizing Committee

Conference Chairperson

Thomas Seager, *Arizona State University*

Program Chairperson

Matthew Eckelman, *Yale University*

Finance Chairperson

Scott Matthews, *Carnegie Mellon University*

Poster Session Chairperson

Jeremy Gregory, *Massachusetts Institute of Technology*

Student Paper Competition Chairperson

Hilary Nixon, *San Jose State University*

Webmaster

WSP Environmental



PROGRAM SESSIONS

SESSIONS 13-15 | WEDNESDAY, MAY 18, 2011, 8:00am – 10:00am

SESSION 13: CORPORATE CASE STUDIES

Location: Lakeshore A

Extension of the Total Cost Assessment Methodology through Application

Lise Laurin and Roland Scholz

A Semiconductor Company's Examination of their Water Footprint Approach

Joyann Pafumi, Suzanne Fallender, Tom Cooper, Jon Dettling and Sebastien Humbert

Autodesk Sustainability Workshop: A New Approach to Sustainable Engineering Education

Adam Menter

Barriers and Benefits to Ecodesign: A Case Study of Tool use in an SME

Sharon Prendeville, Frank O'Connor and Luke Palmer

SESSION 14: LIFE CYCLE ASSESSMENT STUDIES

Location: Lakeshore B

Energy Consumption of VA Hospital CT Scans

Ashkan Sahraie Jahromi, Janet Twomey, Michael Overcash, Bayram Yildirim, Fernando Valenzuela, Tyson Elskan, Nicholas Thomas, Ashlee Mcadam and Amin Esmaeili

Cradle to Grave Life Cycle Assessment of a 15 Inch Carbon Nanotube Field Emission Display Device

Venkata Krishna Kumar Upadhyayula, David Meyer, Mary Ann Curran and Michael Gonzalez

An energy analysis of polylactic acid (PLA) produced from a corn and corn stover integrated system

Qinghua Guo and John Crittenden

Towards Prospective Life Cycle Assessment: Single Wall Carbon Nanotubes for Lithium-ion Batteries

Ben Wender and Thomas P. Seager

SPECIAL SESSION 15: FROM ISSST TO CLASSROOMS (OPEN SESSION)

Location: Lakeshore C

Evaluating Sustainability Knowledge

Alice L. Pawley, Ranjani Rao, Stephen R. Hoffmann, Monica E. Cardella, and Matthew W. Ohland.



PROGRAM SESSIONS

SESSIONS 10-12 | TUESDAY, MAY 17, 2011, 3:00pm – 5:00pm

SESSION 10: ADVANCES IN SYSTEMS MODELING

Location: Lakeshore A

A Framework for Multiphysics Modeling of Natural Environments for Valuation of Privately Owned Ecosystem Service

Stephen Comello and Michael Lepech

Your scrap, my scrap! The flow of scrap materials through international trade

Sahil Sahni and Timothy Gutowski

Insights into Sustainability from complexity analysis of Life Cycle Networks: A case study on Gasoline and Bio-Fuel Networks

Shweta Singh and Bhavik R. Bakshi

Emerging Technologies, Military Operations, and National Security: Fundamental Drivers for Development and Deployment of Radical Technology

Braden Allenby

SESSION 11: MATERIALS AND WASTE MANAGEMENT

Location: Lakeshore B

Rare Earth Metal Recycling

Laura Meyer and Bert Bras

Evaluation of Environmental Tradeoffs in Alkaline Battery End-of-life Treatment

Elsa Olivetti, Jeremy Gregory and Randolph Kirchain

Towards Real-Time Sorting of Recyclable Goods Using Support Vector Machines

Bryan House, David Capson and Derek Schuurman

Disassembly Efficiency Improvements with Active Disassembly Technologies

John Carrell, Hong-Chao Zhang, Derrick Tate and Shiren Wang

SESSION 12: SUSTAINABILITY EDUCATION

Location: Lakeshore C

Rethinking engineering education

Brad Allenby

Developing a Pedagogy of Interactional Expertise for Sustainability Education

Thomas P. Seager, Andrew Berardy, Susan Spierre

Assessment of Engineering Student Learning from Structured Computer Game Play

Jacqueline Isaacs, Donna Qualters, Beverly Dolinsky and Jay Laird

GreenTV: A Project-based Learning Module on Sustainable Electronics

Carol Handwerker, Kory Cooper and Fu Zhao



2011 IEEE International Symposium on Sustainable Systems and Technology

Technical Committee

Matthew Eckelman, *Yale University*, Chair

Braden Allenby, *Arizona State University*

Callie Babbitt, *Rochester Institute of Technology*

Bob Boughton, *California Dept. of Toxic Substances Control*

Roland Geyer, *University of California Santa Barbara*

Jeremy Gregory, *Massachusetts Institute of Technology*

Ramzy Kahhat Abedrabbo, *Arizona State University*

Brandon Kuczenski, *University of California Santa Barbara*

Amy Landis, *University of Pittsburgh*

Deanna Matthews, *Carnegie Mellon University*

Scott Matthews, *Carnegie Mellon University*

Shelie Miller, *University of Michigan*

Hilary Nixon, *San Jose State University*

Thomas Seager, *Arizona State University*

Valerie Thomas, *Georgia Institute of Technology*

Eric Williams, *Arizona State University*

Ming Xu, *University of Michigan*



2011 IEEE International Symposium on Sustainable Systems and Technology

Special Sessions

Tuesday, May 17, 2011

'Uses of ICT technologies in Addressing Environmental and Sustainability Challenges'

In this pair of back-to-back sessions, sustainability leaders from some of the most well-known ICT companies will share their thoughts on how their organizations are using ICT-enabled technology to improve our global well-being. With a focus on innovation, these presentations will cover both hardware and software technologies that represent the cutting edge of solutions to manage complex energy and environmental problems.

Industry speakers include:

- Steve Harper, *Director, Environmental and Energy Policy, Intel*
- John Frey, *Americas Sustainability Executive, Hewlett-Packard*
- Steven Paul Stawarz, *Manufacturing & PLM Sustainability Lead, Oracle*
- Keith Bright, *Program Director, Lab Based Services, IBM*



PROGRAM SESSIONS

SESSIONS 7-9 | TUESDAY, MAY 17, 2011, 10:30am – 12:30pm

SESSION 7: LIFE CYCLE ASSESSMENT METHODS

Location: Lakeshore A

Data Mining Approaches for Life Cycle Assessment

Naren Sundaravaradan, Manish Marwah, Amip Shah, Naren Ramakrishnan, Debprakash Patnaik and Vandana Sreedharan

Exploring the Viability of Probabilistic Underspecification for LCA Streamlining

Siamrut Patanavanich, Elsa A. Olivetti, Jeremy Gregory and Randolph E. Kirchain

Patching Data Gaps Through Expert Elicitation: A Case Study of Laundry Detergents

Vee Subramanian, Eric Williams, Joby Carlson and Jay Golden

Impact of Uncertainty in Activity Data and Emissions Factors on Firm Scope 3 Greenhouse Gas Emissions Estimates

Jeremy Gregory, Pauline Jeong, Elsa Olivetti, Randolph Kirchain and Edgar Blanco

SESSION 8: E-WASTE

Location: Lakeshore B

WEEE Reuse Trials in Ireland

Maurice O'Connell, Colin Fitzpatrick and Stewart Hickey

Reuse of EEE/WEEE in UK: Review on functionality of EEE/WEEE at the point of disposal

Azadeh Dindarian, Steffen Duffy and Andrew Gibson

Sustainable E-waste Education and Research

William Bullock and Aida Williams

An Investigation into the Hazardous Waste, Resource Depletion, and Toxicity Potentials of Light-Emitting Diodes (LEDs)

Seong-Rin Lim, Daniel Kang, Oladele Ogunseitan and Julie Schoenung

SPECIAL SESSION 9: INDUSTRY TRACK - ICT FOR SUSTAINABILITY II

Location: Lakeshore C

Emerging trends for sustainability in enterprise software and hardware technologies and the associated environmental and business benefits that they can deliver

Steven Paul Stawarz (Oracle)

Environmental Informatics: Addressing the New Set of Social and Business Problems

Keith Bright (IBM)



PROGRAM SESSIONS

SESSIONS 4-6 | TUESDAY, MAY 17, 2011, 8:00am – 10:00am

SESSION 4: BUILDINGS AND SUSTAINABILITY

Location: Lakeshore A

Rapid integrated life cycle assessment of building-wide IT systems

Paul Teehan, Stefan Storey and Milind Kandlikar

The Role Of Product And System Interfaces In Designing Zero Emission Buildings

Kristin Stoeren Wigum, Ida Nilstad Pettersen, Johannes Zachrisson and Casper Boks

Multivariate Modeling for a Multi-Stage Green Building Framework

Pin Kung, Victoria Chen and Anthony Robinson

Enabling Dynamic Life Cycle Assessment of Buildings with Wireless Sensor Networks

William Collinge, Liang Liao, Melissa Bilec, Amy Landis, Alex Jones and Laura Schaefer

SESSION 5: ENERGY SYSTEMS

Location: Lakeshore B

Planning the Development of Electrical Grids in Third World Countries: An initial approach using Agent Based Modeling

Jose Alfaro and Shelie Miller

Dependence of Wind Energy on Electric Utility in the US

W. J. Benjamin Bunker and Ming Xu

Reducing Usage Phase Impact Using Demand Side Management

Paddy Finn, Maurice O'Connell and Colin Fitzpatrick

A Systemic Thermodynamic Analysis of Fuel Consumption at Forward Operating Bases

Valentina Prado and Thomas P. Seager

SPECIAL SESSION 6: INDUSTRY TRACK - ICT FOR SUSTAINABILITY I

Location: Lakeshore C

Digital Energy Solutions Campaign

Steve Harper (Intel)

Sensing technologies, Digital printing, and Flexible display technologies

John Frey (HP)



Wednesday, May 18, 2011

'Connecting ISSST to the Classroom: How do we Assess Sustainability Knowledge?'

Today's engineering undergraduate students will work in a world of higher energy costs, reduced availability of natural and material resources, and global climate change. Engineering faculty need to prepare them to work effectively in this world especially in light of increasing global competition. But engineering faculty and professionals are themselves often ill prepared to teach such topics, having limited background and training in sustainability or other environmental issues.

In this special session, researchers will present a system for assessing sustainability knowledge, using observations gathered from the first two days of the ISSST conference. This work is part of an NSF-funded project that aims to assist engineering educators in linking sustainability to existing content through design and energy concepts.

Alice Pawley, Ranjani Rao, Stephen Hoffmann, Monica Cardella, and Matthew Ohland, *Purdue University*



2011 IEEE International Symposium on Sustainable Systems and Technology

Keynote presentation, May 16, 2011

Accomplishments and Opportunities

Robert Pfahl, International Electronics Manufacturing Initiative (iNEMI)

Dr. Pfahl is Vice President of Global Operations at the International Electronics Manufacturing Initiative (iNEMI). Dr. Pfahl has been actively involved with iNEMI since the consortium's beginning fifteen years ago. He leads their global efforts to reduce the environmental impact of electronic products. Over the past decade iNEMI members have been the leaders in developing the technology to allow the electronics industry to eliminate lead (Pb) from their products.

Previously Dr. Pfahl was Director of International and Environmental Research and Development at Motorola Labs, where he led Motorola's Environmental Technology R&D and Advanced Technology R&D labs in China and Germany. Prior to joining Motorola, he was with Bell Labs/Western Electric in a number of research and management positions related to electronics and semiconductor manufacturing. In his 35-year career in the electronics industry, Dr. Pfahl was a pioneer in developing reflow soldering processes. He holds nine U.S. patents in electronics manufacturing technology and is the inventor of the vapor phase soldering process.

The IEEE Components, Packaging and Manufacturing Technology Society (CPMT) presented Dr. Pfahl with its 2005 Electronics Manufacturing Technology Award. He was lauded for developing new manufacturing processes, reducing the environmental impact of electronic manufacturing processes and fostering collaboration within the manufacturing technology community.



PROGRAM SESSIONS

SESSIONS 1-3 | MONDAY, MAY 16, 2011, 2:30pm - 4:30pm

SESSION 1: URBAN SYSTEMS& INFRASTRUCTURE

Location: Lakeshore A

Standardized Analysis of Urban Form

David Quinn and John Fernandez

Water, Energy, Land Use, Transportation, and Socioeconomic Nexus: A Blueprint for More Sustainable Urban Systems

Elizabeth Minne, John Crittenden, Arka Pandit, Hyunju Jeong, Jean-Ann James, Ming Xu, Steve French, Muthukumar Subrahmanyam, Douglas Noonan, Lin-Han Chiang Hsieh, Marilyn Brown, Joy Wang, Reginald Desroches, Bert Bras, Jeff Yen, Miroslav Begovic, Insu Kim, Ke Li and Preethi Rao

Sustainability Assessment of Highways: A Malmquist Index of U.S. States

Omer Tatari and Dhruva Kurmapu

Dynamic modeling of Singapore's urban resource flows: Historical trends and sustainable scenario development

Tamas Abou-Abdo, Noel R. Davis, Karen N. Welling, Jonathan S. Krones and John Fernandez

SESSION 2: DATA CENTERS

Location: Lakeshore B

Estimating Sustainability Impact, Total Cost of Ownership and Dependability Metrics on Data Center Infrastructures

Gustavo Callou, Paulo Maciel, Fábio Magnani, Jair Figueirêdo, Erica Sousa, Eduardo Tavares, Bruno Silva, Francisco Neves and Carlos Araujo

Concentrating Renewable Energy in Grid-Tied Datacenters

Nan Deng and Christopher Stewart

Energy and Locational Workload Management in Data Centers

Sabrina Spatari, Nagarajan Kandasamy, Dara Kusic and Eugenia V. Ellis

Electrical cost savings and clean energy usage potential for HPC workloads

David Aikema and Rob Simmonds

SESSION 3: ASSESSING ICT PRODUCTS

Location: Lakeshore C

Environmental Assessment of Information Technology Products Using a Triage Approach

Melissa Zgola, Elsa Olivetti, Christopher Weber, Sarah Boyd, Jennifer Mangold, Ramzy Abedrabbo, Eric Williams, Jeremy Gregory and Randolph Kirchain

Comparison of Energy Consumption between a Mobile Device and a Collection of Dedicated Devices

Zhongliang Hu and Jussi Ruutu

Application-Aware LCA of Semiconductors: Life-Cycle Energy of Microprocessors from High-Performance 32nm CPU to Ultra-Low-Power 130nm MCU

David Bol, Sarah Boyd and David Dornfeld

Sustainability Consortium Update: Type III Product Declaration Development for Laptops

Carole Mars, Sarah Boyd, Jennifer Mangold, Elsa Olivetti, Melissa Zgola and Kevin Dooley



PROGRAM AT-A-GLANCE

Monday, May 16

8:30 – 5:00pm	Registration (Lakeshore Ballroom Foyer)		
9:00 – 12:00pm	Sustainability sightseeing around Chicago		
10:30 – 12:00pm	Special Session: Building Research and Professional Skills (Lakeshore A)		
12:00 – 1:15pm	Lunch (on own)		
1:15 – 2:15pm	Keynote speaker: Robert Pfahl, International Electronics Manufacturing Initiative (iNEMI) (Lincoln Park)		
2:30 – 4:30pm	Session 1: Urban Systems (Lakeshore A)	Session 2: Data Centers (Lakeshore B)	Session 3: Assessing & Infrastructure ICT Products (Lakeshore C)
4:30 – 4:45pm	Break / Poster Setup		
4:45 – 6:45pm	Poster Session and Reception (3rd Floor)		

Tuesday, May 17

8:00 – 4:00pm	Registration (Lakeshore Ballroom Foyer)		
7:00 – 8:00am	Breakfast (Avenue Cafe) / ISSST Organizing Committee Meeting (Old Town)		
8:00 – 10:00am	Session 4: Buildings and Sustainability (Lakeshore A)	Session 5: Energy Systems (Lakeshore B)	Special Session 6: ICT for Sustainability (Lakeshore C)
10:00 – 10:30am	Networking and Refreshments		
10:30 – 12:30pm	Session 7: Life Cycle Assessment Methods (Lakeshore A)	Session 8: E-Waste (Lakeshore B)	Special Session 9: ICT for Sustainability (Lakeshore C)
12:30 – 2:30pm	Luncheon and Awards (Avenue Cafe)		
2:30 – 3:00pm	Break		
3:00 – 5:00pm	Session 10: Advances in Systems Modeling (Lakeshore A)	Session 11: Materials and Waste Management (Lakeshore B)	Session 12: Sustainability Education (Lakeshore C)

Wednesday, May 18

8:00 – 10:00am	Registration (Lakeshore Ballroom Foyer)		
7:00 – 8:00am	Breakfast (Avenue Cafe)		
8:00 – 10:00am	Session 13: Corporate Case Studies (Lakeshore A)	Session 14: Life Cycle Assessment Studies (Lakeshore B)	Special Session 15: From ISSST to Classrooms (Lakeshore C)
10:00 – 10:30am	Networking and Refreshments		
10:30 – 12:30pm	Session 16: Biofuels (Lakeshore A)	Session 17: Assessing Services (Lakeshore B)	Session 18: Policy and Sustainability (Lakeshore C)
12:30	Bon Voyage		



“Over the course of his career, Dr. Pfahl has developed an expertise in environmental issues affecting the electronics industry. He participated in the pioneering 1994 National Research Council’s study, “The Greening of Industrial Ecosystems.” Dr. Pfahl was a founding member of the International Society of Industrial Ecology. Pfahl is a member of the editorial board of the Journal of Industrial Ecology. He served as a member of the National Materials Advisory Board (NMAB) and the Board on Manufacturing and Engineering Design (BMED) of the National Research Council (USA) and is currently a member of their Board on Materials and Manufacturing Systems (NMMS). In recognition of his efforts to eliminate the use of CFCs in the electronics industry, Dr. Pfahl received the United States EPA Stratospheric Ozone Protection Award. He also received the Electronic Goes Green Award 2008+ from the German Fraunhofer Society “for his commitment to environmental protection and inspiring ideas concerning sustainable development in technology and business solutions.” Dr. Pfahl received his BME, MS, and PhD in mechanical engineering from Cornell University, Ithaca, NY, where he majored in heat transfer and fluid mechanics.



2011 IEEE International Symposium on Sustainable Systems and Technology

Poster Session

Monday, May 16, 4:45 – 6:45pm (3rd Floor)

Life Cycle Assessment of Printed Antenna: Comparative Analysis and Environmental Impacts Evaluation
Rajeev Kumar Kanth, Qiansu Wan, Harish Kumar, Pasi Liljeberg, Lirong Zheng and Hannu Tenhunen

Toxicity potential indicator analysis for alternatives recommendations in the RIO Tronics utility meter pulse products
Carl Lam, Seong-Rin Lim, Oladele Ogunseitan, Andrew Shapiro, Jean-Daniel Saphores, Andrew Brock and Julie Schoenung

A Methodology for Analyzing Energy and Environmental Trade-offs For Different Travel And Information Communication Technology Options
Courtney Grosvenor, Melissa C. Lott and Michael E. Webber

Creating an Environment for Learning about Sustainability and Engineering
Colin Fitzpatrick

Planning the Development of Electrical Grids in Third World Countries: An initial approach using Agent Based Modeling
Jose Alfaro and Shelie Miller

A framework for selecting sustainable behaviour design strategies
Johannes Zachrisson and Casper Boks

Disassembly Efficiency Improvements with Active Disassembly Technologies
John Carrell, Hong-Chao Zhang, Derrick Tate and Shiren Wang

Bike Machines: Creating Informal Learning Environments to Increase Student Awareness and Participation in Sustainability
Sanford Rotter, Rabiah Mayas, Mark Vincent and Lee Ravenscroft

Biologically Inspired Design of Recycling Networks
Laura Meyer and Bert Bras

Energy Consumption of VA Hospital CT Scans
Ashkan Sahraie Jahromi, Janet Twomey, Michael Overcash, Bayram Yildirim, Fernando Valenzuela, Tyson Elskan, Nicholas Thomas, Ashlee Mcadam and Amin Esmaeili

Rapid integrated life cycle assessment of building-wide IT systems
Paul Teehan, Stefan Storey and Milind Kandlikar

Hospital Radiology Department Overhead Energy Estimation
Ashkan Sahraie Jahromi, Janet Twomey, Amin Esmaeili, Fernando Valenzuela, Bayram Yildirim and Michael Overcash

Use of Generative Design for Optimized Building Energy Requirements
John Basbagill, Michael Lepech, Mark Goulthorpe and Kaustuv DeBiswas

The "IAMECO II" A case study in Eco-Design for Personal Computers
Stewart Hickey and Colin Fitzpatrick

Evaluation of IntelliDrive-based Vehicle-Control Systems using Life Cycle Assessment
Kristin Malakorn and Byungkyu (Brian) Park

Environmental Impacts of Healthcare Services: Delivery of X-Ray Services
Mohammad Amin Esmaeili, Janet M. Twomey, Ashkan S. Jahromi, Nicholas O. Thomas, Ashlee N. Mcadam, Fernando V. Dominquez, Michael R. Overcash and M. Bayram Yildirim



Autodesk Sustainability Workshop: Advancing the Practice of Sustainable Engineering Through Education
Adam Menter

Design for Resilience in Coupled Industrial-Ecological Systems: Biofuels Industry as a Case Study
Jeryang Park, Sally Thompson, Thomas Seager, Fu Zhao, Somayeh Beigzadeh-Milani, Ruoxi Wu and P.S.C. Rao

Comparative assessment of environmental life-cycle-based tools: An application to particleboard
Rita Garcia and Fausto Freire

Prioritizing material recovery for end-of-life PCBs
Xue Wang and Gabrielle Gaustad

Life cycle assessment of conventional and advanced plastic pipe materials
Jonathan F. Hubler, Sabrina Spatari, Y. Grace Hsuan, Suk Joon Na and Franco M. Capaldi

Temporal Discounting for Life Cycle Assessment: Differences between Environmental Discounting and Economic Discounting
Qiang Zhai, Bridgette Crowley and Chris Yuan

Use of Life Cycle Assessment in Healthcare: A Preliminary Cesarean Section Case Study
Cassandra Thiel, Melissa Bilec, Amy Landis, Nicole Campion and Noedahn Copley-Woods

Sustainability Assessment of Algae Cofiring in a Coal-fired Power Plant: A Hybrid LCA Model
Murat Kucukvar and Omer Tatari

Tracking the material, energy, and value flow for end-of-life lithium ion batteries in the US
Chelsea Bailey, Callie Babbitt and Gabrielle Gaustad

A Framework for a Fuzzy Sustainable Maintenance Strategy Selection Problem
Farnaz Ghazi Nezami and Mehmet Bayram Yildirim

Methods for Estimating End of Life Electronics Exports from North America
T. Reed Miller, Jeremy Gregory and Randolph Kirchain

Reducing Greenhouse Gas Emissions of Global Automotive Manufacturing through Clean Energy Supply: an Cost Benefit Analysis
Qiang Zhai, Huajun Cao, Xiang Zhao and Chris Yuan

Green Design Considerations for Solar Powered Wireless Sensor Network
Fang Lin Chao, Hung-Chi Chu and Wei-Tsung Siao

Examining End of Life Options (EoL) for smartphones: A comparison between re-use and recycling
Naina Arora, Tina Dietrich and Wilson Chan

Integration of Building Information Modeling and Life Cycle Assessment Software for Improved Building Life Cycle Management
Sarah Russell-Smith and Michael Lepech

Modeling the effects of energy efficiency improvements on life cycle greenhouse gas emissions of products and in determining policy effectiveness
Derrick R. Carlson, H. Scott Matthews, Eric Masanet and Arpad Horvath

Assessing Sensitivity of Variations in Product Formulations: A Case Study of Laundry Detergents
Vee Subramanian, Eric Williams, Lizette Bonvin, Joby Carlson and Jay Golden

Sustainability Measurement & Reporting System
Joby Carlson, Cashion East, Carole Mars, Georg Schoener, Takuma Ono, Vee Subramanian, Sarah Elaine Lewis, Greg Norris, Kevin Dooley, and Greg Thoma

Sustainable Supply Chain Design for Consumer Products
Wesley Ingwersen, Douglas Young, Heriberto Cabezas, Michael Gonzalez and Raymond Smith

Dependence of Wind Energy on Electric Utility in the US
W. J. Benjamin Bunker and Ming Xu