

Department of Energy/Electric Power Research Institute (DOE/EPRI) High Efficiency Thermoelectrics Workshop

February 17-20, 2004

Loews Coronado Bay Resort
San Diego, California

DRAFT AGENDA (1/13/04)

Tuesday, February 17, 2004

- 5:00 – 6:00 p.m. Registration
- 6:00 – 7:45 p.m. Reception (hors d'ouvres and cash bar)
- 7:45 – 8:00 p.m. *Welcoming Remarks*
John Fairbanks, U.S. Department of Energy, Washington, D.C.
- 8:00 – 9:00 p.m. **KEYNOTE ADDRESSES**
- New Directions for Low Dimensional Thermoelectricity*
M. S. Dresselhaus, Massachusetts Institute of Technology, Cambridge, Massachusetts.
- Technology Level Requirements for Solid State Cooling, Heating and Power Generation Commercialization*
Lon Bell, BSST, LLC, Irwindale, California
- 9:00 p.m. *Adjourn*

Wednesday, February 18, 2004

SESSION 1 – QUANTUM WELL THERMOELECTRICS/NANOTECHNOLOGY - I

Moderator: Terry J. Hendricks, National Renewable Energy Laboratory

- 7:00 – 8:00 a.m. *Breakfast*
- 8:00 – 8:20 a.m. *Introduction*
- 8:20 – 8:40 a.m. *Chair's Overview of High Efficiency Thermoelectrics and Potential Applications*
John Fairbanks, U.S. Department of Energy, Washington, D.C.
- 8:40 – 9:05 a.m. *Superlattice Thermoelectric Technology*
Rama Venkatasubramanian, RTI, Research Triangle Park, North Carolina
- 9:05 – 9:30 a.m. *Nanoscale Heat Transfer for Thermoelectric Energy Conversion*
Gang Chen, Massachusetts Institute of Technology, Cambridge, Massachusetts.
- 9:30 – 9:55 a.m. *Thoughts on Inhomogeneous Thermoelectrics*
Terry Aselage, Sandia National Laboratories, and David Emin, University of New Mexico, Albuquerque, New Mexico.
- 9:55 – 10:25 a.m. *Break*

- 10:25 – 10:50 a.m. *High Efficiency Thermoelectrics Development*
Joe Farmer, Lawrence Livermore National Laboratory, Livermore, California
- 10:50 – 11:15 a.m. *Crystal Engineering of Novel Thermoelectric Materials: Films and Bulk*
David C. Johnson, University of Oregon, Eugene, Oregon.
- 11:15 – 11:40 a.m. *Measurement of Thermoelectric Properties of Thin Films*
L. C. Olsen and P. M. Martin, Pacific Northwest National Laboratory, Richland, Washington.
- 11:40 – 12:00 noon *The Design and Application of Quantum Well Film Based Modules*
J. C. Bass, S. Ghamaty D. Allen, V. Jovanovic and N. Hiller, Hi-Z Technology, Inc., San Diego, California
- 12:00 – 1:30 p.m. *Lunch*

SESSION 2 – QUANTUM WELL THERMOELECTRICS/NANOTECHNOLOGY - II

Moderator: John Stringer, Electric Power Research Institute

- 1:30 – 1:55 p.m. *Thermoelectric Materials Characterization at High Temperature Materials Laboratory (HTML)*
Arvid Pasto, Oak Ridge National Laboratory, Oak Ridge, Tennessee.
- 1:55 – 2:20 p.m. *Bulk Thermoelectric Materials for Direct Energy Conversion*
M. G. Kanatzidis, T. Hogan, S. D. Mahanti, and Harold Schock; Michigan State University; C. Uher, University of Michigan; and Tom Shih, Iowa State University.
- 2:20 – 2:45 p.m. *Status of Nanowire Research at UC Berkeley*
Angelica Stacy, University of California, Berkeley, California
- 2:45 – 3:15 p.m. *Break*
- 3:15 – 3:40 p.m. *Emerging Material Needs in Thermoelectrics*
James J. Krajewski, DuPont Research and Development, Wilmington, Delaware
- 3:40 – 4:00 p.m. *Efficient Micro-Combustor for Thermoelectric Modules*
D. S. Marshall, Ceramic Energy Technologies, Chandler, Arizona
- 4:00 – 5:00 p.m. ***Panel Discussion: Are nanotechnology measurement capabilities and fabrication techniques useful to further develop QWT?***
- 5:00 p.m. *Adjourn*

Thursday, February 19, 2004

SESSION 3 – MANUFACTURING ASPECTS OF THERMOELECTRICS

Moderator: John Prater, Army Research Office

- 7:00 – 8:00 a.m. *Breakfast*

- 8:00 – 8:30 a.m. *Thermoelectric Technology Readiness for Large Scale Commercialization*
Lon Bell, BSST, LLC, Irwindale, California
- 8:30 – 8:50 a.m. *High Efficiency Cooling and Power Generation using Electron Tunneling through a Vacuum Gap*
Jim Magdych, Power Chips, Queensway, Gibraltar
- 8:50– 9:20 a.m. *Recent Progress in Scale of Thermoelectric Quantum Well Films*
P. M. Martin and L. C. Olsen, Pacific Northwest National Laboratory, Richland, Washington.
- 9:20 – 9:50 a.m. *Thermoelectrics R&D at Delphi Corporation*
Mohinder Bahati/Nabil Hakim, Delphi Corporation
- 9:50 – 10:20 a.m. *Break*
- 10:20 – 10:45 a.m. *A Roadmap For Waste Heat Recovery: From Here To Successful Usage*
Hylan Lyon, Marlow Industries, Dallas, TX
- 10:45 – 11:10 a.m. *Survey Of Thermoelectric Generator Performance In A Harsh Automotive Environment*
Gustavo Ray, Southwest Research Institute, San Antonio, Texas.
- 11:10 – 11:35 a.m. *Filled skutterudites for efficient power conversion applications*
Citrad Uher, University of Michigan.
- 11:35 – 12:00 noon *High Efficiency Thermoelectrics for the Aircraft, Aerospace, and Refrigeration Industries: Potential Applications within United Technologies Corporation*
Rhonda Willigan, United Technology Research Center, East Hartford, Connecticut
- 12:00 – 1:30 p.m. *Lunch*

SESSION 4 – COMMERCIAL PRODUCTS AND APPLICATIONS - I

Moderator: Suresh Baskaran, Pacific Northwest National Laboratories

- 1:30 – 1:55 p.m. *Advanced Thermoelectric Energy Recovery Systems in Future Vehicle Systems*
Terry J. Hendricks, National Renewable Energy Laboratory, Golden, Colorado.
- 1:55 – 2:20 p.m. *Loop Refrigeration With Advanced Fluidics And Thermoelectric Coolers*
U. Ghoshal, NanoCoolers Inc., Austin, Texas.
- 2:20 – 2:45 p.m. *Automotive Applications for Thermoelectric Technology*
Francis Stabler, General Motors, Pontiac, Michigan.
- 2:45 – 3:15 p.m. *Break*
- 3:15 – 3:40 p.m. *Advances in Thermoelectric Materials and Energy Conversion Technologies at NASA/JPL*
Jeffery Snyder, Jet Propulsion Laboratory-California Institute of Technology, Pasadena, California

- 3:40 – 4:05 p.m. *Thermionic Energy Conversion Center*
Ali Shakouri, University of California, Santa Cruz, California.
- 4:05 – 4:30 p.m. *Perspectives From 29 Years of Thermoelectric Power Generation*
James Bolen and Bernie LeSage, Global Thermoelectric, FuelCell Energy, Inc, Danbury, CT
- 4:30 – 5:00 p.m. *Designing Advanced Thermoelectric Materials for Automotive Applications*
Jihui Yang, General Motors R&D Center, Warren, Michigan
- 5:00 p.m. Adjourn

Friday, February 20, 2004

SESSION 5 – COMMERCIAL PRODUCTS AND APPLICATIONS - II
Moderator: John Stringer, Electric Power Research Institute

- 7:00 – 8:00 a.m. *Breakfast*
- 8:00 – 8:25 a.m. *Status of Current Thermoelectrics Projects and R&D at Teledyne*
Mal McAlonan, Teledyne Energy Systems, Hunt Valley, Maryland
- 8:25 – 8:50 a.m. *Opportunities and Applications for High Efficiency Thermoelectrics*
Mahmoud Taher, Caterpillar Corporation, Peoria, Illinois
- 8:50 – 9:15 a.m. *High Efficiency Thermoelectric Devices Integrated with Nuclear Heat Source for Dense Long Life Portable Power*
Lewis Larsen, Lattice Energy LLC, Chicago, Illinois
- 9:15 – 9:40 a.m. *Department of Defense Interests in High Efficiency Thermoelectrics*
John Prater, Army Research Office, Research Triangle Park, North Carolina
- 9:40 – 10:05 a.m. *Status Report on the Application and Support of Thermoelectric Devices in Asia and Europe*
Hylan Lyon, Marlow Industries, Dallas, Texas
- 10:05 – 10:30 a.m. *Break*
- 10:30 – 11:45 a.m. ***Panel Discussion: What parameters would be necessary for acceptable risk for commercialization?***
- 11:45 – 12:00 noon *Closing Remarks by the Chair*
- 12:00 noon *Adjourn*