



The USC *Power Research* Workshop

8.30 am, November 18, 2011

ACB 238 (second floor West Wing of Ahmanson Center)

Location information at the following websites:

<http://dornsife.usc.edu/distance-learning-studio-classrooms/>

<http://web-app.usc.edu/maps/>

This Power Research Workshop is aimed at developing an understanding of future possible research directions and opportunities. The aim is to explore the possibilities in a broad sense and identify areas where USC might meaningfully contribute.

The presentations will be video recorded.

Slides will also be made available and incorporated into a workshop proceedings document.

Agenda:

8.30am	Coffee
8.55am	Welcome
9.00am	DoD perspective, James Short, OSD ATL
9.30am	Smart grid research, Viktor Prasanna
10.00am	Power electronics, Slobodan Cuk
10.30am	Coffee break
11.00am	Home of the future, Gordon Roesler / Behrokh Khoshnevis
11.30am	Solar voltaic research, Dan Dapkus
12.00pm	Batteries and fuel cell research, Sri Narayan / Surya Prakash
12.30pm	Lunch (sandwiches and salads provided)
1.15pm	The USC Energy Institute, Don Paul
1.30pm	SCE perspective, Syed Ahmed
2.00pm	Batteries, Chongwu Zhou
2.30pm	Discussion and recommendations , led by Tony Levi
3.15pm	Coffee break
3.30pm	Close

Further information and assistance, Marilyn Poplawski, eepadmin@usc.edu, (213) 740-4700

James Short is a visiting professor of Mechanical Engineering at the University of Maryland (2007 – present). A rocket scientist, Professor Short has been the deputy director of mechanical engineering's Center for Energetic Concepts Development since its 1998 inception at which time he was a research engineer at the Naval Surface Warfare Center (NSWC, White Oak) in Silver Spring, Maryland (1978 – 2003). He also has a part-time Pentagon appointment as the senior technical advisor to the Assistant Secretary of Defense for Operational Energy Plans and Programs, the Honorable Sharon Burke (<http://www.defense.gov/bios/biographydetail.aspx?biographyid=259>).

Operational Energy Plans and Programs (OEPP) is an office mandated by Congress in the 2009 National Defense Authorization Act. During the 8 months (Nov 2009 to June 2010) it took the Senate to confirm President Obama's nomination of Ms. Burke, Dr Short planned and organized the Office, and suggested initial research needs. Currently his primary responsibility is Senior Executive oversight of the OEPP Improvement Fund (http://www.acq.osd.mil/osbp/docs/OECIF_energy_CallForProposalsFY12.pdf) if enacted by Congress. The Improvement Fund is referred to in the 2010 Quadrennial Defense Review (http://www.defense.gov/qdr/images/QDR_as_of_12Feb10_1000.pdf) as an innovation fund.

Prior to his university appointment Dr. Short served in various Defense roles while an NSWC employee. He was a weapons staff specialist for the Director, Defense Research & Engineering (1991 -1993), energetics and environmental scientific officer at the Office of Naval Research (1993 – 2002), and scientific advisor to the Principal Deputy Director, Defense Research & Engineering (2002 – 2004). His final DoD position was a Senior Executive Service appointment as Director of Department of Defense Laboratory Programs in the Office of the Secretary of Defense (2004 – 2007). He was responsible for policies governing the operation of the (approximately) 100 DoD laboratories, including the formulation of recommendations concerning realignment & closure of technical facilities made to the President's 2005 Base Realignment and Closure Commission.

He is the Executive Editor of the Journal of Energetic Materials (2009 – present). Previously he was Chairman of the International Detonation Symposium (1981 – 2001). He holds a A.B. in mathematics (Syracuse, 1968), a B.S in aerospace engineering (Syracuse, 1969), and a Ph. D. in mechanical engineering with a specialty in combustion (Berkeley, 1976).

Viktor K. Prasanna is the Charles Lee Powell Chair in Engineering in the Ming Hsieh Department of Electrical Engineering and Professor of Computer Science at the University of Southern California.

He is the executive director of the USC-Infosys Center for Advanced Software Technologies (CAST) and is an Associate Director of the USC-Chevron Center of Excellence for Research and Academic Training on Interactive Smart Oilfield Technologies (Cisoft). He also serves as the director of the Center for Energy Informatics at USC. He served as the Editor-in-Chief of the IEEE Transactions on Computers during 2003-06. Currently, he is the Editor-in-Chief of the Journal of Parallel and Distributed Computing. He was the founding Chair of the IEEE Computer Society Technical Committee on Parallel Processing. He is a Fellow of the IEEE, the ACM and the American Association for Advancement of Science (AAAS). He is a recipient of the 2009 Outstanding Engineering Alumnus Award from the Pennsylvania State University. Currently, he leads the USC demand response optimization efforts of the Los Angeles Department of Water and Power Smart Grid Project funded under the Department of Energy Smart Grid Regional Demonstration Program.

Slobodan Cuk came to Caltech in 1974 and obtained his PhD degree in Power Electronics in 1976. From 1977 until December, 1999 he was at the California Institute of Technology where he conducted research and taught courses in Power Electronics and Fundamentals of Energy Processing. During his 23 years at Caltech, more than 35 students obtained Ph.D. degree in Power Electronics under his guidance. From 2000 until present, Dr. Cuk continued his research contributions through TESLAco, the company he founded. Dr. Cuk is Fellow of IEEE and is the inventor of numerous switching converter circuits such as the Cuk converter, the TESLAconverter and many others.

Dr. Cuk is also the originator of the State-Space Averaging Method and more recently new switching methods: Hybrid Switching and Storageless Switching methods, which resulted in a number of ultra efficient, very compact and low cost switching converters for solar inverters, AC-DC battery chargers, data center power supplies and many other Power Electronics applications.

Gordon Roesler is the USC ISI director of energy research. Before coming to ISI, he was a senior physicist in the Ocean Sciences Division of the Science Applications International Corporation (SAIC). Previously, he was a DARPA program manager, a Branch Scientist at Booz Allen Hamilton, and a Research Scientist at the US Department of Energy.

He was affiliated with the Navy between 1975 and 1996, first as an active duty officer (submarines), later in the reserve.

He is a member of the American Institute of Aeronautics and Astronautics and the American Physical Society; and a recipient of the Office of the Secretary of Defense Exceptional Public Service Award and the Hammer Award from former Vice President Al Gore.

Behrokh Khoshnevis is a professor of Industrial & Systems Engineering, Civil & Environmental Engineering, and Aerospace and Mechanical Engineering. He is the Director of the Center for Rapid Automated Fabrication Technologies (CRAFT) and Director of Manufacturing Engineering Graduate Program at USC. He is active in CAD/CAM, robotics and mechatronics related research projects that include the development of novel additive fabrication processes, automated construction of civil structures, development of mechatronics systems for biomedical applications and autonomous mobile and modular robots for fabrication and assembly applications on earth and in space. In the energy field, he has developed technologies for improving production of gas wells, for electric energy generation using a new wind turbine installation paradigm, and for energy storage for renewable energy based grid. His inventions have received extensive worldwide publicity in acclaimed international media. The automated construction invention, Contour Crafting was selected as one of top 25 best inventions from more than 4000 candidate inventions by the National Inventors Hall of Fame and the History Channel's Modern Marvels program. Contour Crafting is the subject of a currently funded NASA project for Lunar construction. He is a NASA NIAC Fellow, a Fellow of the Institute of Industrial engineering and a Fellow of the Society for Computer Simulation.

P. D. (Dan) Dapkus is the W. M. Keck Professor of Engineering in the Ming Hsieh Department of Electrical Engineering at USC. He also serves as the Director of the Center for Energy Nanoscience and Technology and was formerly the Director of the Center for Photonic Technology. He was educated at the University of Illinois where he received the BS in

Engineering Physics and an MS and PhD in Physics. He has worked at Bell Laboratories (1970 – 1976) on light emitting diode technology and at Rockwell International where he was a group leader and manager in charge of electronic materials, solar cell development, and photonic devices prior to becoming a faculty member at USC in 1982. As a group leader at Rockwell, he led the effort that resulted in the development of metalorganic chemical vapor deposition (MOCVD) technology and the demonstration of the first devices by that process, including the first solar cells by MOCVD and practical quantum well lasers. He has received the IEEE David Sarnoff Award, the IEEE LEOS Engineering Achievement Award, and the OSA Nick Holonyak, Jr Award for his work and was an IEEE LEOS Distinguished Lecturer. He is a Fellow of IEEE, OSA, APS and AAAS and a member of the National Academy of Engineering.

Sri Narayan worked for 20 years at NASA's Jet Propulsion Laboratory (JPL) where he led the fuel cell research activities for over 15 years and also headed the Electrochemical Technologies Group for 7 years. While at JPL, Dr. Narayan and his associates pioneered the development of direct methanol fuel cell power sources for military and commercial applications, developed new approaches to catalyst preparation by the sputter-deposition technique, new membranes and stacks, and demonstrated a range of hybrid power source systems for space and defense application. He received NASA-JPL's Exceptional Achievement Award for the development of direct methanol fuel cell and transferring the technology to industry. He has over 35 journal publications and 40 US Patents on various aspects of electrochemical technology. He has delivered invited talks on numerous occasions and has organized several conferences under the auspices of the Electrochemical Society. He is currently the Chairman of the Energy Technology Division of the Electrochemical Society of USA. He has active collaborations with various DoE National Laboratories and Industry. Prof. Narayan joined the faculty of the Department of Chemistry, Loker Hydrocarbon Research Institute in May 2010 to advance electrochemical power sources research.

Surya Prakash joined the faculty of USC in 1981 and is the George A. and Judith A. Olah Nobel Laureate Chair in Hydrocarbon Chemistry at the Loker Hydrocarbon Research Institute and Department of Chemistry. He also serves as the Director of the Institute. His primary research interests are in superacid, hydrocarbon, synthetic organic and organofluorine chemistry, with particular emphasis in the areas of energy and catalysis. He is a co-inventor of the proton exchange membrane based direct oxidation methanol fuel cell and a co-proponent (with Professor Olah) of the Methanol Economy concept. Professor Prakash is a prolific author with more than 630 peer-reviewed scientific publications and holds 30 patents. He has also co-authored or edited 10 books. He has received many awards and accolades including two American Chemical Society National Awards: in 2004 for his achievements in the area of fluorine chemistry and in 2006 for his contributions to hydrocarbon chemistry. He also received the 2006 Richard C. Tolman Award from the Southern California section of the American Chemical Society for his scientific contributions to Southern California. He is the recipient of the 2007 Distinguished Alumni Award from his alma mater, Indian Institute of Technology, Madras and the 2010 CRSI Medal from the Chemical Research Society of India. He is a fellow of the American Association of Advancement of Science and a Member of the European Academy of Arts, Sciences and Humanities. He also sits on several Editorial Boards of Chemical Journals.

Donald Paul is the Executive Director of the University of Southern California Energy Institute and William M. Keck Chair in Energy Resources, Research Professor of Engineering, Research Professor of Earth Science, and Research Professor of Policy, Planning, and Development.

Prior to his current position he had a successful thirty-three career with the Chevron Corporation, retiring in June 2008. From 1997 to 2008 he was Vice-President and Chief Technology Officer of Chevron Corporation. In this role he was responsible for all of Chevron's research, technology, and technical support functions including exploration, production, refining, information technology, and emerging energy technologies. From 1994 to 1997 he was President and Director of Chevron Canada Resources, Ltd: CEO of Chevron's Canadian subsidiary for exploration, production, infrastructure, and resource marketing operations. With partners, he oversaw construction and development of the giant Hibernia oil field, the first and largest in Atlantic Canada. From 1992 to 1994 he was President of the Chevron Petroleum Technology Company: Architect and founding president of Chevron's integrated upstream research and technology company.

Syed Ahmed is a Consulting Engineer for Advanced Technology at Southern California Edison. He received his Ph.D. in electrical engineering from the University of California at Irvine. He is currently developing the Advanced Technology Asset Management Roadmap for SCE. Dr. Syed's expertise is in high voltage transmission engineering, power flow, and utility power transfer. His present primary job is as a senior engineer for Southern California Edison, where he conducts research for a number of generation and transmission projects, including superconductor research with the U.S. Department of Energy and the Electric Power Research Institute. Dr. Ahmed is also the former associate dean of West Coast University.

Chongwu Zhou is a full professor of Department of Electrical Engineering at University of Southern California (USC). He previously held the Jack Munushian Associate Professor (2006 - 2011) and was an Assistant Professor from 2000 to 2006 at USC. He received the Ph.D. in Electrical Engineering from Yale University in 1999, and worked as a postdoc at Stanford University from 1998 to 2000.

Dr. Zhou has authored over 131 journal publications with altogether 11,724 citations. His work has been reported by Science, Scientific American, Physics Today, MRS Bulletin, Materials Today, National Cancer Institute, and Royal Society of Chemistry. His research interest covers carbon nanotubes, nanowires, graphene, bionanotechnology, and energy nanotechnology. His research group consists of postdocs and students with background in electrical engineering, physics, chemistry, and materials science.

He is currently an Associate Editor for IEEE Transactions on Nanotechnology. He has received a number of awards, including the NSF CAREER Award (2002), the NASA TGIR Award (2002), the USC Junior Faculty Research Award (2004), and the first IEEE Nanotechnology Early Career Award (2007).