

## Systems & Control Science for the Future of Humanity: Role of controls in power and energy

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Abstract: Systems and control science is a high-tech field of science and engineering that plays an important role in a growing number of technological and social-economic developments. Today large complex physical systems interact with a considerable and increasing number of distributed computing elements for monitoring, control and management. The elements of the physical systems are interconnected through the exchange of matter, energy or momentum while the elements of the control and management systems are interconnected through communication networks, which often impose restrictions on the information exchange. Example of systems are smart grids and power plants, water management, traffic management (for cars, airplanes or ships), smart manufacturing process with many cooperating elements (e.g., robots, machines, warehouses, conveyer belts), large processing plants with many process units, buildings with advanced distributed control, etc. This talk is geared to power and energy systems. By better design, coordination and management of these systems, day to day life can be improved significantly by better services, lower consumption of energy and resources, and lower emissions. With rising environmental regulation, a paradigm shifts from fossil to green energy; however, without the intervention of control, this shift wouldn't be as effective. Energy and power as an area divided into numerous subareas and each subarea has a different control problem. Control technology is inevitably at the heart of as many engineering and science applications as one can imagine. The talk summarizes the role of control in generation, transmission, distribution, renewable energy and energy storage.

Bio: Dr. Lee received his B.S. degree in Electrical Engineering from Seoul National University, Seoul, Korea,

in 1964, and the M.S. degree in Electrical Engineering from North Dakota University, Fargo, ND, in 1968, and the Ph.D. degree in Systems Science from Michigan State University, East Lansing, MI, in 1971. Since 1971 he has been a faculty member of electrical engineering at Michigan State University, Oregon State University, University of Houston, the Pennsylvania State University and Baylor University, where he is currently a Professor and Chair of Electrical and Computer Engineering.

For 21 years at Penn State, he served as Director of Power Systems Control Laboratory and the Intelligent Distributed Controls Research Laboratory. He has been a consultant for Allegheny Power System on reactive power planning. He has conducted several DOE, NSF, EPRI, and Navy projects on Intelligent Distributed Control of Fossil Plants, Nuclear Plants, and Fuel Cell Power Plants. Dr. Lee is the



author of over 400 technical publications and book chapters. His current research interests include power system control and optimization, economic operation, generation expansion planning, reactive power planning, load forecasting, power plant control, fuel cell power generation, and intelligent system applications to power systems.

Internationally, Dr. Lee coordinated the NSF/KOSEF U.S.A.-Korea Joint Seminar on Expert Systems for Electric Power Systems. He conducted several NSF/KOSEF cooperative research projects on Power System Expansion Planning and on the Intelligent Distributed Control for Power Plants and Power Systems. He served as the Technical Program Chairman for the International Conference on Intelligent System Applications to Power Systems (ISAP '97, ISAP '05) and the Board Member of the ISAP. He is serving as the Chair of the Technical Committee on Power and Energy Systems (TC 6.3) in the International Federation of Automatic Control (IFAC) and served as the Editor for the 2003 IFAC Symposium on Power Plants and Power Systems

Control, Seoul, Korea. He also organized the Mini Symposium on Smart Girds for 2011 and 2014 IFAC World Congresses, in Milan and Cape Town, respectively. He is the International Program Committee Chair for the IFAC Symposium on Control of Power and Energy Systems (CPES 2015), New Delhi, India. He was invited as a Visiting Chaired Professor of Advanced Technology for Electrical Energy at Kumamoto University, Japan, under the sponsorship of Kyushu Electric Power Company and the NSF/Japan Center for Global Partnership. Recently, he was the moderator for Engineering for Mission at the 2010 Electrical and Computer Engineering Department Heads Association.

Dr. Lee is a Life Fellow of IEEE, active in the Intelligent Systems Subcommittee and Station Control Subcommittee of the IEEE Power and Energy Society. He has been a frequent panelist on intelligent control, distributed simulation, combined research and curriculum development, and undergraduate research, and a tutorial speaker/organizer on artificial neural networks, fuzzy systems and evolutionary computation. Dr. Lee served as an Editor of IEEE Transactions on Energy Conversion and Associate Editor of IEEE Transactions on Neural Networks, and Associate Editor of IFAC Journal on Control Engineering Practice. He has served in several NSF review panels for proposal evaluation.

Monday, February 20, 2017 Livermore Center 101 | 2:00 – 3:00 pm Coordinator: Dr. Beibei Ren (Beibei.ren@ttu.edu)