Professor Massoud Amin, D.Sc.

Professor Massoud Amin (http://umn.edu/~amin) witnessed the 1977 NYC blackout, the 9/11 tragedies near DC, and the collapse of the I-35W bridge. He works on enabling smart, secure and resilient infrastructures. He leads extensive projects in smart grids and is considered the father of smart grid.

Since March 2003 Professor Amin has served as director of the Technological Leadership Institute (TLI, http://tli.umn.edu), holds the Honeywell/H.W. Sweatt Chair in Technological Leadership), is a University Distinguished Teaching Professor and a professor of electrical and computer engineering at the University of Minnesota.

At TLI, he leads 7 endowed chairs and 54 associated faculty from across the 8 colleges on the University of Minnesota, executives from industry and governmental leaders, to develop local and global leaders for technology enterprises. His responsibilities at TLI include direction and oversight of all academic, financial and administrative elements of TLI's educational, research and consulting programs. In addition, Dr. Amin led the Master of Science in Management of Technology program as its Director of Graduate Studies during 2003-2010 at TLI.

He founded the Master of Science in Security Technologies (MSST) program in 2009 and the Master of Science in Medical Device Innovation (MS-MDI) program in 2013, as a result of an 8-year effort emanating from TLI's 2004 strategic plan, which captures input of over 150 stakeholders from more than 50 public and private enterprises, who confirmed the local to global need, content and format for this interdisciplinary program. The MS-MDI program is at once broad-based and deeply focused, thus offering the flexibility to build expertise in one or two areas of specialization, while providing the ability for 360 analysis and integration. In creating this program, we have received enthusiastic support and involvement from industry and policy leaders.

TLI's graduate and professional programs prepare executives, managers, and students to understand, anticipate, and effectively manage the innovation, market and societal challenges of the complex and highly competitive global industries. TLI has had substantial positive impact on the economy of Minnesota and beyond by developing local and global leaders for public and private enterprises.

Dr. Amin teaches several courses including Smart Grids, Complex Dynamical Systems, Emerging and Pivotal Technologies, Critical Infrastructure Security and Protection, S&T Policy, IP Valuation and Strategy, and Security. His research focuses on two areas: 1) Global transition dynamics to enhance resilience, agility, security and efficiency of complex dynamic systems. These systems include national critical infrastructures for interdependent energy, computer networks, communications, transportation and economic systems. 2) Technology scanning, mapping, and valuation to identify new science and technology-based opportunities that meet the needs and aspirations of today's consumers, companies and the broader society.

Before joining the university in 2003, he held positions of increasing responsibility at the Electric Power Research Institute (EPRI) in Palo Alto. After 9/11, he directed all Infrastructure Security R&D and led Grid Operations/Planning and Energy Markets. Prior to that, he served as head of mathematics and information sciences.

While working at EPRI Dr. Amin conceived and articulated the vision of a *smart self-healing grid* where the use of computer, communication, sensing and control technologies operating in parallel with an electric power grid, to enhance reliability, improve security, increase resilience and reduce the cost of energy to consumers. Self-healing refers to a system that uses information, sensing, control and communication technologies to deal with unforeseen events and minimize their impact. This was a very bold concept and a radical departure from the status quo necessitating fundamental advances in research and development (R&D) activities of various disciplines.

Expressing this vision was only the first step of the process in achieving the stated goals as such massive projects require the successful collaboration of many individuals and organizations. Demonstrating exceptional technical leadership Dr. Amin spearheaded the effort to create appropriate government/university/industry partnerships to tackle the problem. What emerged was the largest systems-theoretic R&D initiative during 1998-2001, a $24 million joint EPRI/DoD initiative in complex interactive networks/systems (CIN/SI). This partnership provided funding to six research consortia consisting of 108 professors, over 200 researchers from 28 U.S. universities, and two energy companies, to address modeling and management of US critical infrastructures. The success of this project has been demonstrated in various ways and includes 420 publications and 24 technologies extracted and implemented in industry.

Throughout the course of the CIN/SI, Dr. Amin formed alliances, led contracting, funding, and management of these government/university/industry consortia for the full range of basic research to products. His responsibilities also included supervision of all aspects of program administration (from concept to the marketplace, including content, direction, evaluation, funding, contracting and IP/commercialization), with numerous stakeholders. His unique ability to engage diverse groups (including 94% of the North American utilities, universities, companies, several US Government agencies, the

US Congress, the National Academy of Engineering, the National Governors' Association, and the White House), with a clear mission-driven purpose to advance both understanding mathematical underpinnings of these complex and critical systems is exemplary, and evidence of his superb management abilities. Due to his pioneering work in Smart Self-Healing Grids, he is considered the "father of the Smart Grid."

With the outstanding accomplishments of the CIN/SI initiative and in response to 9/11, he was promoted and directed all security-related R&D at EPRI for our nation's utilities, including the Infrastructure Security Initiative and the Enterprise Information Security. He advised Governor Ridge and his staff at the U.S. OHS/DHS, staff at the White House and OSTP, Director of the NSF, Undersecretaries at the U.S. DoE and DoD, DIA, FBI, and other agencies, innovating effective solutions and pragmatic strategies against advanced threats.

The impact of his campaign for a *smart self-healing grid* is also evident from the following:

- The area of self-healing infrastructure, which he pioneered and works in, was recommended in 2005 by the White House Office of Science and Technology Policy (OSTP) and the U.S. Department of Homeland Security as one of three thrust areas for the National Plan for R&D in support of Critical Infrastructure Protection.

- His foundational work in the above areas has become a leading concept in sixteen on-going programs at EPRI, NSF, DHS, DoE and DoD. These initiatives continue to be widely successful at EPRI, DoE, national labs, and smart grid initiatives in the industry worldwide. Industries involved in developing/managing smart-grid technologies range from telecom/IT, semiconductors and equipment manufacturers to traditional energy suppliers.

- Defense applications of his work are in Network-Centric Objective Force, which is now part of the Future Combat Systems ($40B).

In addition to his technical leadership activities Dr. Amin has maintained an active research program and made significant contributions in predictive system identification methods coupled with analytical and multi-domain modeling, fast simulation, optimization, testing methodologies, and applies them to complex and large dynamical systems. Since 2003, he has given four briefings at the White House and nine Congressional briefings on smart grids, security, and leadership in scientific R&D. He was one of the three external faculty members on behalf of the Engineering directorate at the NSF to create the content and foci for the Cyber-infrastructure division at the NSF in CISE. He has also served as a U.S. delegation representative to several world engineering and scientific congresses. He is regularly interviewed by the media including: New York Times; USA Today; Reuters; CNN; BBC; Washington Post; Forbes; Wall Street Journal; U.S. News; AP; NPR; and PRI.

He served as chairman of power and energy for ASME's Critical Asset Protection Initiative (2002-2005), founding member of the IEEE Computer Society's Task Force on Security and Privacy (2002-2006), served on the Board of the Center for Security Technologies (CST) at Washington University (2002-2006), and is the founding chairman of the IEEE smart grid newsletter (2010-2014), Chairman of IEEE Smart Grid (2013- present), and the IEEE Control Systems Technical Committee on Smart Grids (2009-present).

He was three times Professor of the Year at Washington University in St. Louis (1992-1995), and was inducted into the University of Minnesota's Academy of Distinguished Teachers in 2008. At EPRI he received several awards including six EPRI Performance Recognition Awards for leadership in three areas the 2002 President's Award for the Infrastructure Security Initiative, and twice received the Chauncey Award, the Institute's highest honor.

He serves as Chairman of the Board of Directors of the Texas RE (12/2013-present, Vice Chair 12/12-12/13, Chair of the Audit & Governance Committee, 2010-2012), and is a BoD member and chair of the hearing committee of the Midwest Reliability Organization (MRO). He served as a member of the Board on Infrastructure and the Constructed Environment (BICE) at the U.S. National Academy of Engineering (2001-2007) and member of the Board on Mathematical Sciences and Applications (BMSA) at the National Academy of Sciences (2006-2009).

He is a fellow of the ASME and IIIA, Sigma Xi (served as President of the Minnesota Chapter 2011-2013), Tau Beta Pi, Eta Kappa Nu, a senior member of IEEE, AAAS, AIAA, and NY Academy of Sciences. He is the author of more than 200 peer-reviewed publications and the editor of seven collections of manuscripts, and serves on the editorial boards of six academic journals.

Dr. Amin holds B.S. (cum laude) and M.S. degrees in electrical and computer engineering from the University of Massachusetts-Amherst, and M.S. and D.Sc. degrees in systems science and mathematics from Washington University in St. Louis, Missouri. He has been recognized by his alma maters, receiving the 2011 Distinguished Alumni Achievement Award at Washington University, and the 2013 Outstanding Senior Alumni Award at the University of Massachusetts. For more information please see http://massoud-amin.umn.edu and http://linkedin.com/in/massoudamin, for related short videos please see: http://discover.umn.edu/2010/smartgrid.php and TEDx http://www.youtube.com/watch?v=CurJGL_aqYA