



NATIONAL ACADEMY OF ENGINEERING

OF THE NATIONAL ACADEMIES

CHARLES M. VEST
President

October 29, 2009

Dear Colleague,

A great nation must address the grand challenges of its time, and I invite you to be part of the process. In September 2009, the Executive Office of the President of the United States released a white paper outlining a foundation for American innovation and shared prosperity. In a category titled "Catalyze Breakthroughs for National Priorities," the paper specifically cites addressing the grand challenges of the 21st century as being essential to sustainable growth and quality of life.

These grand challenges — clean energy, advanced vehicle technology, and breakthroughs in health information technology — are encapsulated within the 14 areas the National Academy of Engineering has identified as the "Grand Challenges for Engineering in the 21st Century" (www.engineeringchallenges.org).

In March 2009, Duke University, Olin College, and the University of Southern California hosted the Summit on the National Academy of Engineering Grand Challenges in Durham, NC. This event brought together thought leaders from industry, government, and academia to initiate a conversation on addressing the daunting tasks before us. Several positive things grew out of that event, but two warrant special mention.

Duke's Pratt School of Engineering, Olin College of Engineering, and the University of Southern California's Viterbi School of Engineering announced the establishment of the Grand Challenge Scholars Program (www.grandchallengescholars.org), as a call to action by U.S. schools of engineering to instill undergraduates with the technical expertise, breadth of knowledge, and the social, ethical, and global awareness to successfully pursue leadership positions in addressing the NAE Grand Challenges for Engineering. The program was endorsed by the National Academy of Engineering in February 2009, and has been adopted by more than 21 colleges and universities. When fully implemented, this program will yield several thousand graduates per year who are uniquely prepared to address the grand challenges.

In addition, the more than 60 engineering and technology school deans who attended the 2009 Summit made a commitment to continue and expand the grand challenges dialogue through a series of regional conferences and national summits (www.grandchallengesummit.org). Over the next year, university teams will host events in Raleigh, Chicago, Boston, Phoenix and Seattle, culminating with a second national summit hosted by USC's Viterbi School of Engineering in Los Angeles. The Summit Series meetings will address the grand challenges broadly with panels focused on specific topics.

These gatherings are essential to attracting bright minds from all sectors of our society and embracing the global reach of these challenges. Success in addressing these challenges will only be possible through partnering with leaders in Corporate America, key policy makers, and luminaries in the fields of engineering and science education. I urge you to give your support the Grand Challenge Summit Series.

Sincerely yours,

Charles M. Vest

CMV/lbm

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Dear Colleague,

We would like to personally invite you to attend the National Academy of Engineering Grand Challenge Summit in Raleigh, NC on March 3-5, 2010.

The Raleigh Summit <www.grandchallengesummit.org/raleigh-summit> is a high profile venue to help prepare the next generation of engineers to address the “grand challenge” level issues that will shape the 21st century. We view this event as an opportunity to shape and advance engineering education in the Southeast, as well as a chance to strengthen relationships with our regional colleagues.

The Summit will touch on the fourteen grand challenges <www.engineeringchallenges.org> identified by the National Academy of Engineering through a discussion of American innovation and competitiveness and will be of interest to all engineering disciplines. We also plan to focus on the grand challenge themes of energy, health, and nuclear security. The Summit is a highly interactive forum where participants can speak directly with thought leaders such as John Chambers, CEO of Cisco; Jeff Immelt, CEO of GE; Senator Ted Kaufman; and Under Secretary for Energy Kristina Johnson. A working schedule for the event is included below.

The Summit has a strong student component, including a student activity day and a poster competition. We encourage you to share this with your students so they can be a part of this national conversation. We also hope that you will be able to join us for this important national conversation about the future of engineering education.

The attached document has details on the Summit, including a working agenda and profiles of some of the speakers. Please take a moment to review the package. You are invited to register now at <http://www.grandchallengesummit.org/raleigh-registration>.

Sincerely,

Louis Martin-Vega
Professor and Dean
North Carolina State University
College of Engineering

Tom Katsouleas
Professor and Dean
Duke University
Pratt School of Engineering

What is the Summit Series?

The Grand Challenge Summit Series represents a commitment to sustain critical dialogue and engagement with grand challenge problems and to change the way we educate our students in order to better prepare them for the challenges ahead.

The Grand Challenges are a critical grouping of problems that must be addressed and solved in order to maintain our national security, quality of life and ensure a sustainable future. The National Academy of Engineering, in collaboration with the National Science Foundation, identified the challenges to serve as a call to action and as a focal point for societal attention on the importance of science and engineering in maintaining and enhancing our—and our children’s—standard of living.

Over the next year, university teams will host events in Raleigh, Chicago, Boston, Phoenix and Seattle, culminating with a second National Summit in Los Angeles organized by Duke University’s Pratt School of Engineering, the University of Southern California Viterbi School of Engineering, and Olin College of Engineering. The Summit Series meetings will address the grand challenges broadly with panels focused on specific topics.

Grand Challenge Summit in Raleigh

North Carolina State University and Duke’s Pratt School of Engineering are co-hosting the Grand Challenge Summit in Raleigh, NC on March 3-5, 2010. The Summit is a two and a half-day event with leading engineering, science, policy experts and industry leaders focusing on the grand challenges related to engineering better medicines, providing energy from fusion and preventing nuclear terror. Panels of experts will engage with industry, the academic community, and the public. The event will also feature a “Student Day” designed to immerse university students in the grand challenge issues.

Register for the Raleigh Summit at <http://www.grandchallengesummit.org/raleigh-summit>.



2009 National Summit Organizers: USC Viterbi School of Engineering Dean Yannis Yortsos, Duke University Pratt School of Engineering Dean Tom Katsouleas, and Olin College of Engineering President Richard Miller.

Goals of the Summit Series

- (1) Enhancing interest in engineering and science by using the Grand Challenges as a teaching tool, articulating the importance of engineering and science to society and the importance of policy to engineering innovation and implementation. This will be accomplished through:
 - a. Creating educational materials and an awareness campaign on the Grand Challenges.
 - b. Engaging students and faculty together at the participating institutions to consider solutions to the Challenges, in formal classroom settings and out-of-the-classroom design activities.
- (2) Increasing the visibility and importance of engineering and science to society.
 - a. Engaging important companies and leaders in articulating the importance of these Challenges and the underlying educational needs that must be nurtured to create a workforce prepared to solve these problems.
 - b. Engaging the NAE/NAS community, in particular the committee that articulated the Grand Challenges, and the Committee on Science, Engineering and the Public Policy.
 - c. Engaging congressional members/law/policy makers.
 - d. Disseminating Summit findings broadly.
 - e. Conducting a national survey of audiences representing the public, high school and college students and professional engineers.
- (3) Underscoring the importance of recognizing that engineering and science education must be coupled to policy/business/law and must be student-focused.
- (4) Stimulating future collaborations of interested scientists, engineers, policy makers and researchers in business, law, social sciences and humanities needed to successfully address these complex societal issues.

Endorsed by the National Academy of Engineering, the Summit Series will be seminal events for defining the practice and education of engineering. We invite you to take a part in setting the stage for change.

Grand Challenge Topics for the Summit in Raleigh



Engineer Better Medicines – Engineers are developing new systems to use genetic information, sense small changes in the body, assess new drugs, and deliver vaccines.



Provide Energy from Fusion – Human-engineered fusion has been demonstrated on a small scale. The challenge is to scale up the process to commercial proportions in an efficient, economical, and environmentally benign way.



Prevent Nuclear Terror – The need for technologies to prevent and respond to a nuclear attack is growing.

**Preliminary Program for the Summit on the
National Academy of Engineering Grand Challenges in Raleigh, NC**

Wednesday, March 3, 2010	
Grand Challenges Summit Student Day Activities & Conference Kick-Off	
12:30 – 1:00 pm	Student Registration <i>Talley Student Center, NCSU</i>
1:00 – 1:15	Welcome (Conference Opening) Louis Martin-Vega, Professor & Dean of Engineering, NCSU and Tom Katsouleas, Professor & Dean, Pratt School of Engineering, Duke <i>Talley Student Center Ballroom, NCSU</i>
1:15 – 1:40	Grand Challenges Boot Camp (Lecture) <i>Talley Student Center Ballroom, NCSU</i>
1:40 – 2:00	Grand Challenges Q&A <i>Talley Student Center Ballroom, NCSU</i>
2:00 – 3:00	Student Program <i>Talley Student Center Ballroom, NCSU</i>
2:30 – 4:30	General Conference Registration <i>Raleigh Marriott City Center</i>
3:00 – 5:30	Student Campus Tours <i>Nuclear Reactor, Main Campus, NCSU</i> <i>Biomanufacturing Training and Education Center & Engineering Buildings,</i> <i>Centennial Campus, NCSU</i>
6:00 – 8:00	Welcome Reception <i>Museum in downtown Raleigh</i>
Thursday, March 4, 2010	
Grand Challenges Summit	
7:15 – 8:15 am	Registration & Continental Breakfast <i>Raleigh Marriott City Center Ballroom Lobby</i>
8:15 – 8:45	Welcome Louis Martin-Vega, Professor & Dean of Engineering, NCSU Tom Katsouleas, Professor & Dean, Pratt School of Engineering, Duke <i>Raleigh Marriott City Center State Ballroom</i>
8:45 – 9:15	Keynote Speaker – All Grand Challenges

	Jeff Immelt, Chairman and CEO, General Electric
9:15 – 9:45	Panel I – Engineering New Medicines Spotlight Speaker
9:45 – 10:45	Panel I – Engineering New Medicines
10:45 – 11:00	Break
11:00 – 11:30	Keynote Speaker – Energy Grand Challenges Kristina Johnson, Undersecretary of Energy, U.S. Department of Energy
11:30 – 12:00	Panel II – Energy Grand Challenges Spotlight Speaker
12:00 – 1:00	Panel II – Energy Grand Challenges
1:00 – 2:15	Lunch <i>Raleigh Convention Center Ballroom C</i>
<i>Return to Raleigh Marriott City Center State Ballroom for afternoon panels</i>	
2:30 – 3:00	Panel III – Nuclear Fusion Spotlight Speaker Ed Moses, Lab Director for Lasers and Fusion, LLNL and Ned Sauthoff, Director of the U.S. ITER Project, ORNL
3:00 – 4:00	Panel III – Nuclear Fusion
4:00 – 4:30	Student Poster Awards
4:30 – 6:00	Student-Deans/Industry Reception <i>Raleigh Convention Center</i>
6:30 – 7:30	General Conference Meet-Up Mixer <i>Raleigh Convention Center</i>
Free evening for Summit attendees, will provide local transportation information and downtown guide	
6:30 – 9:00	Invited Dinner <i>Invitation only, downtown Raleigh</i>
Friday, March 5, 2010 Grand Challenges Summit	
7:00 – 7:50 am	Registration & Continental Breakfast <i>Raleigh Marriott City Center Ballroom Lobby</i>
7:50 – 8:00	General Comments
8:00 – 8:30	Keynote Speaker – Engineering Grand Challenges: Response from Congress Ted Kaufman, Senator (D, Delaware) and Engineer

8:30 – 9:00	Keynote Speaker – American Competitiveness John T. Chambers, Chairman and CEO, CISCO
9:00 – 10:00	Panel IV – American Innovation and Competitiveness
10:00 – 10:30	Break
10:30 – 11:15	Panel V – Preventing Nuclear Terror Spotlight Speaker Graham Allison, Harvard Kennedy School
11:15 – 12:15	Panel V – Preventing Nuclear Terror David Hill, Deputy Director of INL
12:15 – 1:15	Student Leader Panel
1:15 – 1:30	Closing Remarks

Confirmed Speakers



Edward E. "Ted" Kaufman, Senator and Engineer

Kaufman is the junior U.S. Senator from the state of Delaware appointed for two years to fill the term of former U.S. Senator Joe Biden, who resigned to become Vice President of the United States. He earned a Bachelor of Science degree in mechanical engineering from Duke University and a Master of Business Administration from the Wharton School. Kaufman originally moved to Delaware in 1966 to work for DuPont as an engineer. In 1972 he joined Joe Biden's U.S. Senate campaign on a volunteer basis. Afterwards, he took a one-year leave of absence from DuPont to organize and head Senator Biden's Delaware Office and in 1976 he became Biden's Chief of

Staff/Administrative Assistant and served until 1995. Since 1991, Ted has taught courses in the law school, business school and public policy program of his alma mater, Duke University. From 1995 to 1999 he was Co-Chair of the Duke Law School Center for the Study of the Congress.



John T. Chambers, Chairman and Chief Executive Officer, Cisco

John Chambers is Chairman and CEO of Cisco. He has helped grow the company from \$70 million when he joined Cisco in January 1991, to \$1.2 billion when he assumed the role of CEO, to its current run rate of \$36 billion. In November 2006, Chambers was named Chairman of the Board, in addition to his CEO role. Chambers has received numerous awards for his leadership over his past 13 years at the helm of Cisco including: Time Magazine's "100 Most Influential People," one of Barron's "World's Most Respected CEOs," the "Best Boss in America" by 20/20, one of BusinessWeek's "Top 25 Executives Worldwide," "CEO of

the Year" by Chief Executive Magazine, the Business Council's "Award for Corporate Leadership," and "Best Investor Relations by a CEO" from Investor Relations Magazine three times. During his tenure as CEO, Cisco has been named to Fortune's "America's Most Admired Company" list seven times, BusinessWeek's "Top 50 Performers" list six times, Forbes' "Leading Companies in the World," and is one of the top 10 places to work in the United States, China, Germany, France, India, UK, Australia, Singapore, and several other countries.



Kristina Johnson, Under Secretary for Energy, Department of Energy

Kristina M. Johnson, Ph.D. is currently the Under Secretary for Energy at the Department of Energy in Washington, D.C. Prior to her appointment as Under Secretary, Dr. Johnson was Provost and Senior Vice President for Academic Affairs at The Johns Hopkins University. She received her B.S., M.S. (with distinction) and Ph.D. in electrical engineering from Stanford University. After a NATO post-doctoral fellowship at Trinity College, Dublin, Ireland, she joined the University of Colorado-Boulder's faculty in 1985 as an Assistant Professor and was promoted to full Professor in 1994. From 1994 to 1999 Dr. Johnson directed the NSF/ERC for Optoelectronics Computing Systems Center at the University of Colorado and Colorado State University, and then served as Dean of the Pratt School

of Engineering at Duke University from 1999 to 2007. Dr. Johnson was named an NSF Presidential Young Investigator in 1985 and awarded a Fulbright fellowship in 1991. Her awards include the Dennis Gabor Prize for creativity and innovation in modern optics (1993); State of Colorado and North Carolina Technology Transfer Awards (1997, 2001); induction into the Women in Technology International Hall of Fame (2003); the Society of Women Engineers Lifetime Achievement Award (2004); and in May of 2008, the John Fritz Medal, widely considered the highest award in the engineering profession. Previous recipients of the Fritz Medal include Alexander Graham Bell, Thomas Edison and Orville Wright.



David Hill, Deputy Laboratory Director - Science & Technology

David J. Hill is deputy laboratory director for Science & Technology. An internationally acknowledged expert on nuclear reactor and fuel cycle issues, Dr. Hill has extensive experience in the area of international nuclear matters, working with the countries of both Western Europe and the former Soviet Union. He joined Idaho National Laboratory from Oak Ridge National Laboratory, where he was associate laboratory director, Energy and Engineering Sciences. Previously, Hill served at Argonne National Laboratory, where he was deputy associate laboratory director of Engineering Research, having held positions as director of the divisions of Reactor Analysis and Engineering, Reactor Engineering, and the International Nuclear Safety Center. He holds a bachelor's degree in mathematics and a doctorate in mathematical

physics from Imperial College, London University, and an MBA from the University of Chicago.



Graham Allison, Professor, Harvard's John F. Kennedy School of Engineering

Graham Allison is Director of the Belfer Center for Science and International Affairs and Douglas Dillon Professor of Government at Harvard's John F. Kennedy School of Government. As "Founding Dean" of the modern Kennedy School, under his leadership, from 1977 to 1989, a small, undefined program grew twenty-fold to become a major professional school of public policy and government. Dr. Allison has served as Special Advisor to the Secretary of Defense under President Reagan. He has the sole distinction of having twice been awarded the Department of Defense's highest civilian award, the Distinguished Public Service Medal, first by Secretary Cap Weinberger and second by Secretary Bill Perry. He served as a member of the Defense Policy Board for Secretaries Weinberger,

Carlucci, Cheney, Aspin, Perry and Cohen. Dr. Allison's first book, *Essence of Decision: Explaining the Cuban Missile Crisis* (1971), was released in an updated and revised second edition (1999) and ranks among the bestsellers in 20th century political science with more than 400,000 copies in print. His latest book, *Nuclear Terrorism: The Ultimate Preventable Catastrophe*, is now in its third printing, and was selected by the *New York Times* as one of the "100 most notable books of 2004."



Ned Sauthoff, Director of U.S. Contributions to ITER Project, Oak Ridge National Laboratory

Dr. Ned Sauthoff is a plasma physicist and project manager of the U.S. Contributions to ITER Project, the U.S. portion of an international partnership aimed at demonstrating the scientific and technological feasibility of fusion energy using magnetic confinement of plasmas. ITER is a large toroidal magnetic confinement device of the tokamak configuration that is being built by China, the European Union, India, Japan, South Korea, the Russian Federation, and the United States. It will be sited in Cadarache, France. Prior to establishment of the U.S. ITER Project Office, Sauthoff was head of the Off-Site Research Department at the Princeton Plasma Physics Laboratory (PPPL), where he managed research on leading facilities

around the United States and the world to address key fusion physics and technology questions. Sauthoff received his bachelor's degree in physics and master's degree in nuclear engineering from MIT in 1972 and his Ph.D. in astrophysical sciences from Princeton University in 1975. He developed x-ray instrumentation and performed research on tokamak plasmas at PPPL from 1975 to 1980. He managed design of the control and data system for the Tokamak Fusion Test Reactor (TFTR) until 1985 and headed the PPPL Computer Division until 1988, the Princeton Beta Experiment until 1990, the Experimental Projects Department until 1992, the Physics Department until 1994, and the Plasma Science and Technology Department until 1997. Dr. Sauthoff was the president of IEEE-USA in 2001 and was IEEE-USA's Vice-President for Technology Policy from 1998 to 1999. He is a fellow of the American Physical Society (APS), the American Association for the Advancement of Science (AAAS), and the Institute of Electrical and Electronics Engineers, Inc. (IEEE).



Edward Moses, Principal Associate Director NIF & Photon Science

Edward Moses has 18 years of experience developing Department of Energy/National Nuclear Security Administration (DOE/NNSA) laser systems and 30 years of experience developing and managing complex laser systems and high-technology projects. As associate director (AD) for the National Ignition Facility (NIF) Program from 2005 to 2007 and now as principal associate director for the NIF & Photon Science Directorate, he is responsible for completing construction and bringing into full operation the world's largest optical instrument for achieving ignition in the laboratory and for studying inertial fusion energy. He has been instrumental in sustaining

the program's current strong performance. Moses joined Lawrence Livermore Laboratory in 1980, becoming program leader for isotope separation and material processing and deputy AD for Lasers. From 1990 to 1995, he was a founding partner of Advanced Technology Applications, Inc., which advised clients on proposing and designing high-technology projects. He returned to LLNL in 1995 as assistant AD for program development, physics and space technology. Moses received his bachelor's degree and doctorate from Cornell University in New York. He has won numerous awards, including the 2003 NNSA Award of Excellence for Significant Contribution to Stockpile Stewardship, the 2004 DOE Award of Excellence for the first joint LLNL/Los Alamos National Laboratory experiments on NIF, and the D.S. Rozhdestvensky Medal for Outstanding Contributions to Lasers and Optical Sciences. He holds seven patents in laser technology and computational physics.