



# AMERICA'S INNOVATION IMPERATIVE AND YOU

*OR HOW NOT TO FALL OFF  
THE EDGE OF  
THE FLAT EARTH*



**Dr. Russell Lefevre**  
President, IEEE-USA



# The Innovation Imperative



1956 IBM – 5Mb



2005 Toshiba – 4GB



2007 Fusion – 640GB

# Characteristics of the New Global Economy

- The rapid dissemination of technology and technical know-how
- Increasing importance of access to global markets to obtain economies of scale
- 24/7 engineering projects and processes managed globally
- Growth of trade in technical services, including adoption of national policies designed to secure competitive trade positions
- Competitiveness is increasingly driven by an organization's ability to innovate effectively in this new environment.

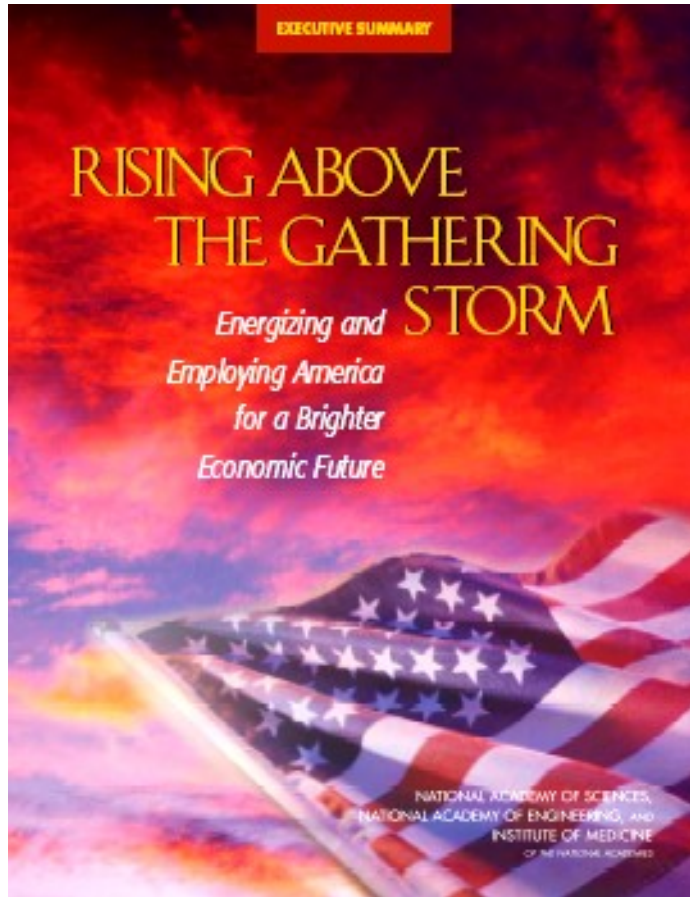


# The U.S. Commission on National Security in the 21st Century



“The inadequacies of our system of research and education pose a greater threat to U.S. national security over the next quarter century than any potential conventional war that we might imagine.”

# Rising Above the Gathering Storm

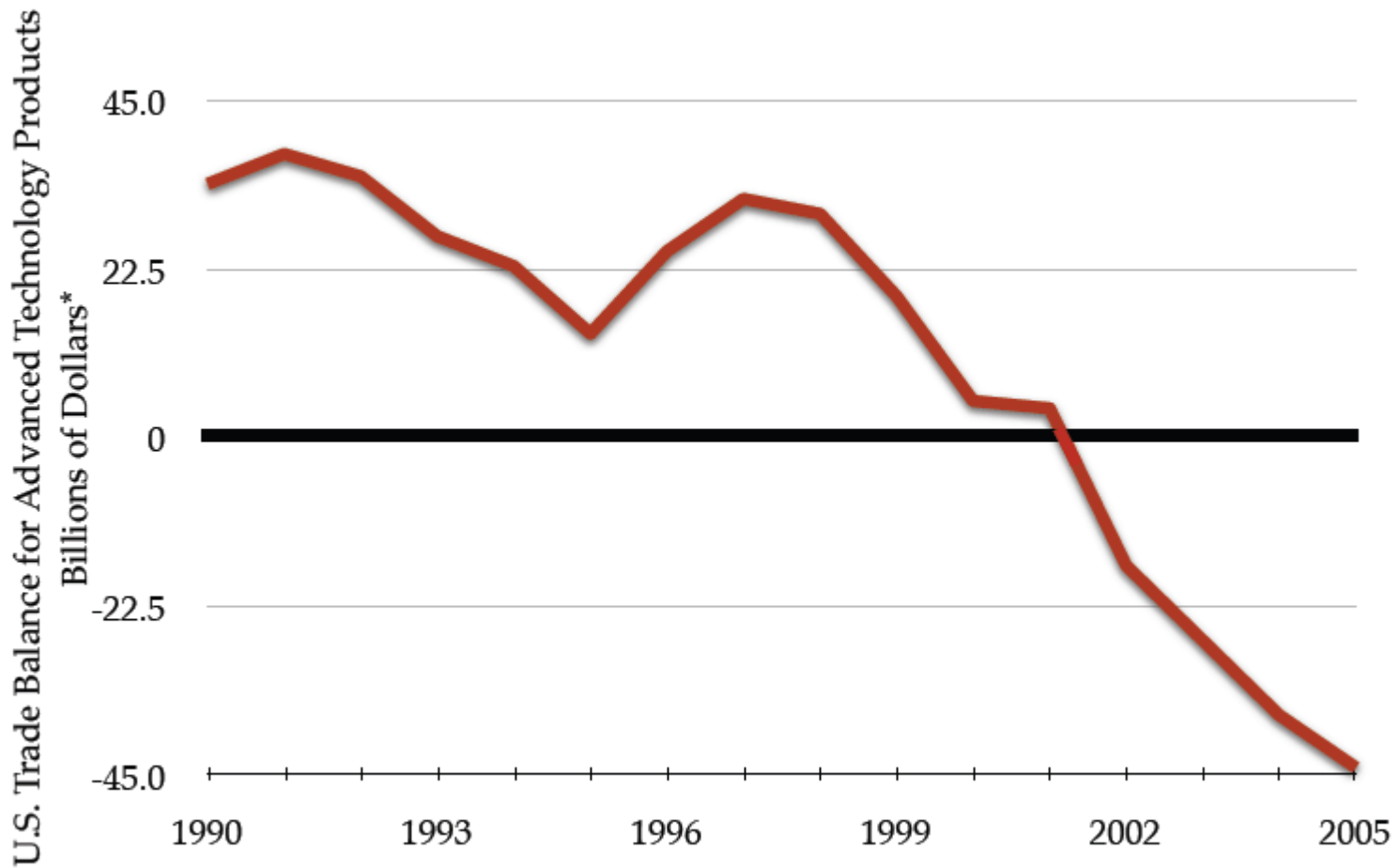


[http://www.nap.edu/catalog.php?record\\_id=11463](http://www.nap.edu/catalog.php?record_id=11463)



Norman R. Augustine  
*Chairman and CEO*  
*(retired)*  
Lockheed Martin  
Corporation

## U.S. Advanced Technology Trade Deficit Deepens

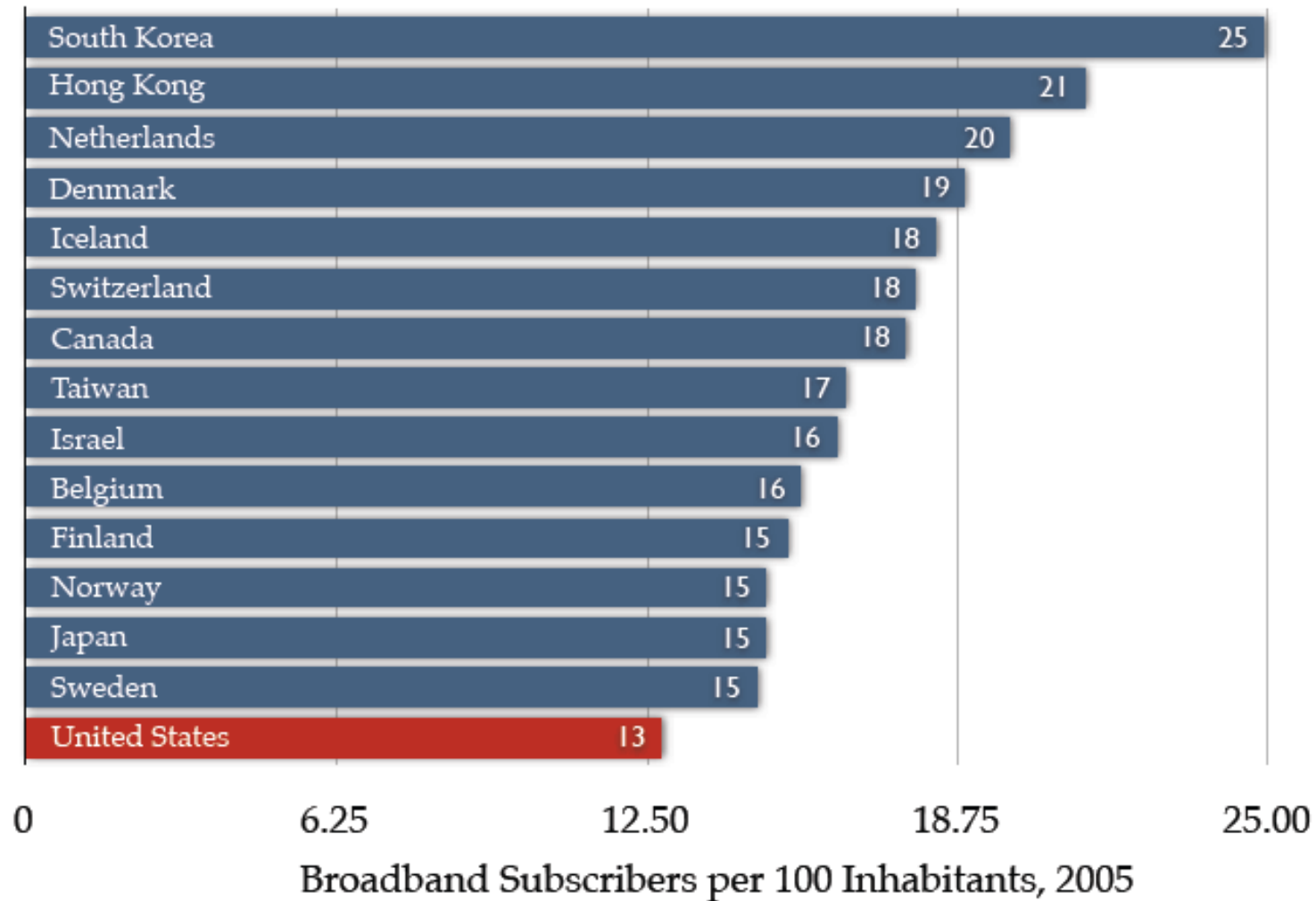


Source: U.S. Census Bureau Foreign Trade Statistics, *U.S. International Trade in Goods and Services*.

Compiled by the APS Washington Office.

\* Constant Chain-weighted 2000 Dollars

## U.S. Lags Many Countries in Broadband Penetration



Source: International Telecommunication Union, November, 2005.

# IS AMERICA FALLING OFF THE FLAT E ARTH?

- 77% of world's new R&D sites planned for the next three years will be built in China or India, many with US financing.”
- The US share of semiconductor manufacturing capacity dropped from 36% to 11% since 2000.
- In 2000, the number of foreign students studying physical sciences/engineering in US graduate schools surpassed, U.S. students for the first time.
- Foreign capital finances 2/3's of US domestic investments, compared to 1/15th a decade ago.

# The Education Challenge

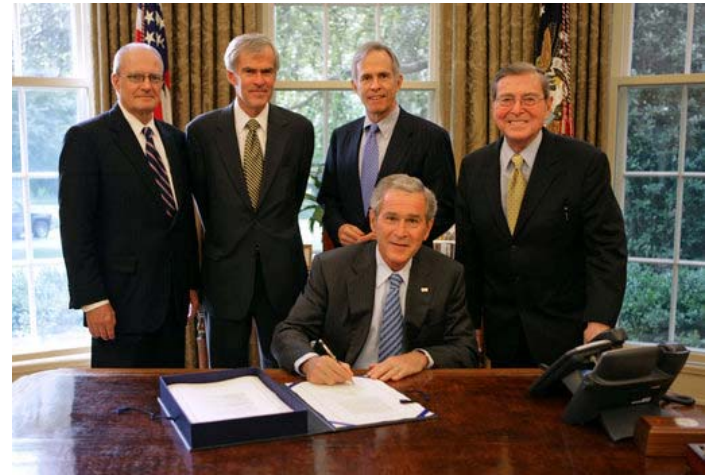
- 30% of America's adults do not know that Earth revolves around the sun, 22% do not know that the center of Earth is very hot, and over half do not know that electrons are smaller than atoms.

(Source: National Science Board)

- In 2000, 69% of students in U.S. public schools, grades 5-8, were taught math by teachers with no major or certification in the subject. 31% in grades 9-12. For science, the numbers were 93% and 63%. (Source: NCES)

# Congress Responds: The America Competes Act

- Authorizes significant R&D funding increases at NSF, DOE's Office of Energy Science and NIST.
- Increases Federal emphasis on high-risk frontier research and innovation acceleration
- Strengthens education in science, technology, engineering, mathematics, and critical foreign languages (including Noyce Teacher Scholarships)
- Reauthorizes the federal high performance computing initiative



# IEEE-USA Actively Lobbied For the America Competes Act

- Worked with S&T Community to keep pressure on Congress
- Meetings with key Congressional Staff
- Testimony Before House and Senate Committees
- Mobilized IEEE Members in Grassroots Efforts



# The Limits of An Authorization Law

- The America Competes Act is an *Authorization* bill.
- An authorization bill and \$3.50 will get you a cup of coffee at Starbucks!
- All “*authorized*” programs must have funds allocated to them in *Appropriations* bills.



# Funding the America Competes Act

- Last Fall, Congress and the Administration fundamentally disagreed on overall federal funding levels proposed in the 12 annual appropriations bills.
- As time ran down, Congress wrapped 11 spending bills into an Omnibus Appropriations bill, which was signed into law on Dec. 26th.
- The resulting “Train Wreck” not only failed to fund the America Competes Act authorizations, but effectively gutted most science and technology budgets, zeroing out many programs such as ITER.



# Repairing the Damage



- The budget cuts generated strong criticism from the engineering and science communities, industry and major newspapers:

“The greater harm will be in the corrosion of scientific research capability, which will weaken the innovative spirit upon which this country's...economic dominance has been built.” – *Chicago Tribune*, Feb. 8, 2008
- In response, Congressional leaders are considering restoring \$500M to \$1 billion in FY 2008 funding to key agencies in a Supplemental Appropriations bill.



# The President's American Competitiveness Initiative

The President's FY 2009 Budget Request outlines an American Competitiveness Initiative that is very good for *some* S&T agencies:

- NSF – up 14% to \$6.9 billion
- DOE Office of Science – up 19% to \$4.7 billion
- DOD Basic Research (6.1) – up 4.0% to \$1.7 billion
- But not so good for others:
  - DOD S&T (6.1-6.3) – down 11.7%
  - NASA Basic & Applied Research – down 8%

# The People Questions

- How will we ensure that we have people interested and adequately prepared to sustain U.S.'s innovative capabilities?
- How will we retrain and utilize engineers? What incentives will be provided to the engineer to move into new fields and relocate?
- How do we ensure that those who make a career choice in technology have a realistic opportunity to have a rewarding career of sufficient duration to produce a financially secure retirement?

# **Maintaining Career Vitality**

Finding opportunity in a marketplace where engineers are available around the World at a lower cost is all about managing your career strategically, maintaining your skill set, and successfully innovating.

# Engineers in Demand

## Now and in the Future

- New and emerging technologies (e.g. nanotechnology in medicine, energy, transportation, etc.)
- Technology at the boundaries of disciplines (e.g. mechatronics)
- Homeland Security
- Software (reliability, virtualization, IPv6, Web 2.0 services)
- Design (RF, analog, ASIC)
- Utilities (power, nuclear, green generation)
- Biomedical and Biotechnology (sensors)
- Critical Infrastructure Protection
- IT (cybersecurity, gaming)
- Green revolution (autos/transportation, buildings)





## Managing Your Career

- Be a dynamic engineer, not a transactional engineer.
- Invest in yourself
- Monitor trends and anticipate change
- Explore your options
- Build a network of professional peers (your safety)

# Grand Challenges for Engineering

## From the NAE



- Environmentally friendly power
  - Nuclear fusion
  - Capturing Carbon Dioxide
  - Countermeasures for nitrogen cycle programs
  - Quality and quantity of water
  - “Reverse-engineering” the brain
  - Computerizing health information
- Countering terrorist violence
  - Sustaining aging infrastructures of cities and services
  - Improved methods of instruction and learning
  - Computer-related virtual realities
  - Enhancing exploration at the frontiers of reality and knowledge
  - Cybersecurity
- New medicines to counter epidemics

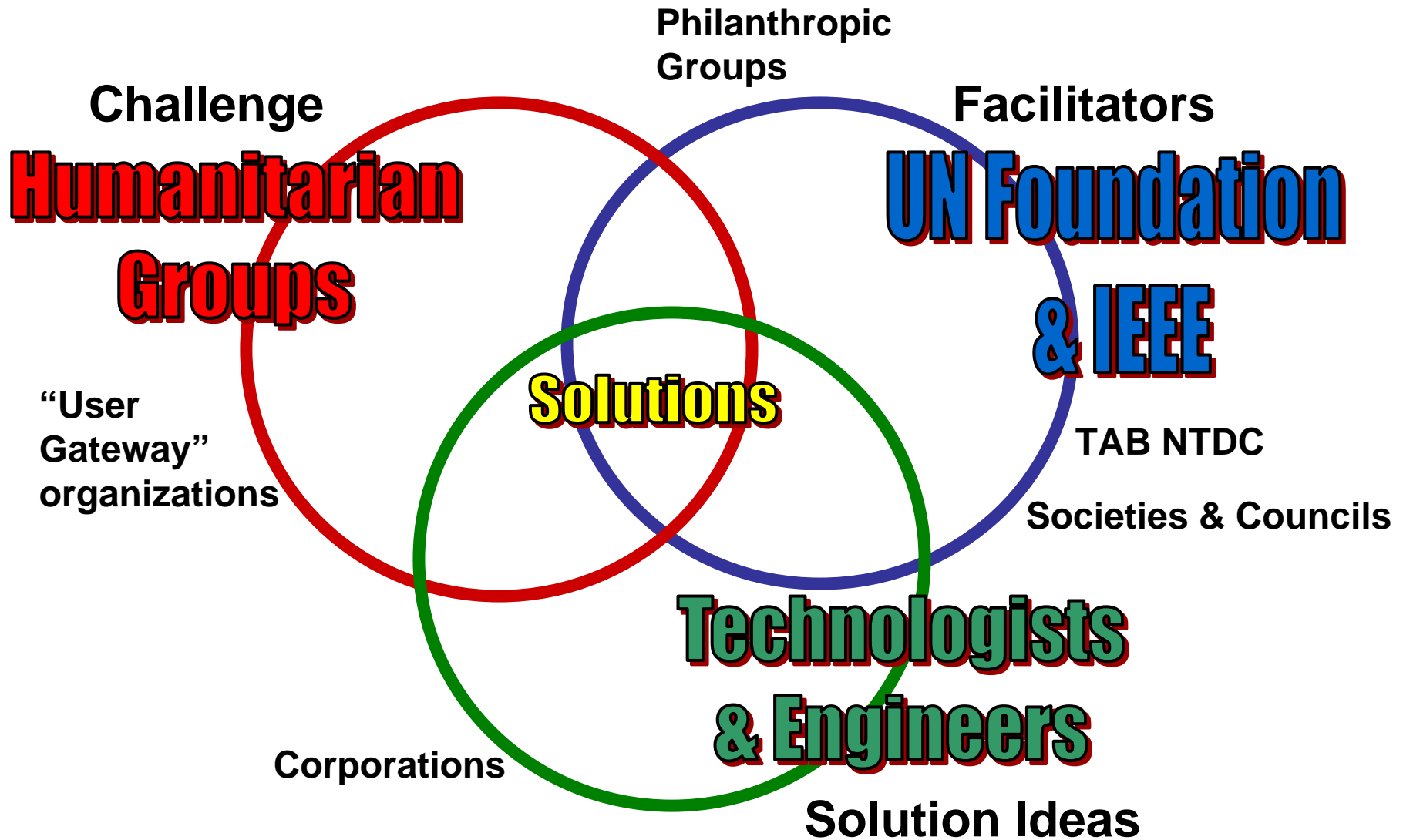




# The IEEE Humanitarian Technology Challenge

- A focused collaboration between IEEE and the United Nations Foundation to develop technology-based solutions to some of the most intractable problems facing the world – particularly in developing regions
- Participants will include:
  - Non-Governmental Organizations (NGOs)
  - World Health Org., Red Cross and U.N.
  - Governments of developing countries
  - Corporations
  - IEEE Societies/Councils, Sections, and Members.

# Working Together - HTC



# HTC Project Goal

- Bring together humanitarian organizations, first responders, technical experts (practicing technologists, professionals, and academicians), companies, philanthropic groups to address some critical humanitarian-based world problems
- Initial emphasis:
  - Public Health (healthcare)
  - Disaster Response/Management



# Closing Notes

- We face great challenges from globalization, but also opportunities.
- As engineers, we need to own our careers and equip ourselves for the turbulence that lies ahead.
- As a nation, we need to make wise decisions about education and sustaining our nation's technological capabilities.
- This can only happen if engineers are more engaged, in our schools, communities, and in public policy.
- Organizations like IEEE-USA are there to help.

# QUESTIONS AND ANSWERS

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