Five Years After Rising Above the Gathering Storm

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Introduction

- 2005 ***Rising Above the Gathering Storm*** Report has had remarkable longevity.

- 2010 ***RAGS, Revisited – Approaching Category 5*** provides a chilling account of reality

Today:

- How did this start?

- What progress have we made?

- What should we be doing?

Sen. Lamar Alexander, May 11, 2005

- Closing Comments 2005 NAS Meeting
  - Titled remarks "**The Next Big Surprise**" ----
    "in 10 or 20 years other countries may close the economic gap between themselves and the U.S."
  - "The world will no longer allow 5% of the people to control 30% of the wealth."
  - "We need to work together to ensure that our current prosperity is passed on to the next generation"

Congressional Brushfire Ignited

• On May 27 NAS received a **Senate** letter requesting response to maintaining U.S preeminence in S&T.

• On June 30 NAS receive a **House** letter requesting response . . . by September 30.

• Recognized that the future **economy, security and quality of life** depends on innovation, largely derived from science and engineering.

Response: NRC Committee

- RAGS Committee: 20 members: Nobel laureates, national lab directors, university presidents, CEOs, former presidential appointees

- Norm Augustine, Chair

- SOT: What top ten federal actions would **enhance the U.S. science and technology enterprise** so that the Unites States can successfully **compete, prosper, and be secure** in the 21st century?

Targeted call-to-action by Federal Government

- Straight-forward set of prioritized recommendations with price tags and time lines

- Sen Alexander touted the report in the Senate, putting his credibility behind a report that didn't yet exist and a committee that had yet to meet, setting the stage for a media blitz following its presentation in October 2005

- **<u>Problem:</u> SOT extended beyond several different federal agency responsibilities reaching into State and local issues, like k-12 education and regional innovation, and even into the private sector.**

Academy Report October 2005

– Report targeted two needs considered critical to every American:

- What action steps are necessary to ensure **high quality, high paying jobs** for Americans?
- How can the nation ensure a **plentiful supply of clean and affordable energy**?

4 recommendations & **20** steps

- **K-12 Science and Mathematics Education: Highest Priority Recommendation**
  - Teachers and talent pool
- **Science and Engineering Research**
  - Basic research and transformational ideas
- **Best and Brightest**
  - Talent: American and Global
- **Incentives for Innovation**
  - THE premier place in the world to innovate, invest and create high-paying jobs

4 recommendations & **20** steps

- **K-12 Science and Mathematics Education: Highest Priority Recommendation**
  - Human Capital
- **Science and Engineering Research**
  - Knowledge Capital
- **Best and Brightest**
  - Human Capital
- **Incentives for Innovation**
  - Location, location, location

Authorization of America Competes August 9, 2007

- three-year authorization
- Most support from one-time ARRA funds
- Many different responsible authorities and budgets
- DOE most assertive response
  - ARPA-E formed to undertake high risk energy ventures
  - strong support from Secretary Chu and the President.

America Competes reauthorized on January 4, 2011

- Miraculously (House 228-130)
- Increasing science and research investments
- Strengthening STEM education
- Developing a national infrastructure for innovation
- Double the budgets at NSF, DOE-Science and NIST over 10-years (if funds are appropriated)

What progress have we made?

Is the U.S. more competitive today than 5 years ago?

- **K-12 Science and Mathematics Education**

- 2009 PISA
  - Performance Reading, Mathematics and Science evaluated student literacy
    - 34 OECD countries plus 41 others

  - U.S. ranked **34th** math (below OECD avg); **22nd** science and **17th** reading (at OECD avg)

  - South Korea: **1st** OECD country, below avg per capita income

  - U.S.: avg OECD country; **1st** in OECD per capita income

  - Shanghai: scored **1st** in each subject and **1st** overall.

2010-11 World Economic Forum (Davos)

- WEF ranks global competitiveness 139 countries annually.
- U.S. education ranked
  - **34th** in **primary education quality**
  - **52nd** in **math and science education quality** (below the 40th percentile) and
  - **26th** in **higher educational systems**
- The relative performance U.S. K-12 students continues to decline, particularly in math and science.
  - Few of our high school graduates are capable of pursuing careers in science or engineering.
  - Other countries are not standing still.

What progress have we made?

Is the U.S. more competitive today than 5 years ago?

- **Science and Engineering Research**
  - Federal support of research declined 60% over forty years - **1.92% GDP** in 1964 and **0.76%** GDP in 2004
- Federal support university research is declining compared to other countries (ITIF, Atkinson and Stewart, May 2011)
  - 2008 **0.24%** GDP ranked the U.S. **22nd** of **30** countries, below the country avg **0.34%** GDP
  - Sweden ranked highest **0.61%** GDP, 2.5 times the U.S. level
- Industrial support university research ranked the U.S. **21st** of **30** at **0.020%** GDP.
  - Industry support declined 7% since 2000

What progress have we made?

Is the U.S. more competitive today than 5 years ago?

- **Best and Brightest**
- Higher education globally is under great stress
- Everywhere higher education is expanding
- New and reformed Universities are leaping out of the ground
- Some are associated with foreign universities, but many have significant resources, bold visions and excellent facilities.
- Talent is in great demand –The competition for it is fierce and can only get more intense.

What progress have we made?

Is the U.S. more competitive today than 5 years ago?

- U.S. is no longer the beneficiary of weak higher education systems and inadequate job opportunities abroad that drove the world's highest-quality students to study and careers in America.
- As those deficiencies abroad continue to decline and opportunities increase, competition for talent can only increase.
- 2/3 U.S. PhD degrees in engineering are awarded to international students. Blessing or problem or both?
  - The universities sending the largest number of students to U.S. PhD programs in sciences and engineering are:
    - 1st Tsinghua University,
    - 2nd Peking University and
    - 3rd UC Berkeley.

What progress have we made?

Is the U.S. more competitive today than 5 years ago?

- Desire to immigrate to the U.S. by skilled U.S. resident Chinese and Indian S&E workers was surveyed in April 2011 by the Kauffman Foundation

  - In 2009 the number of Chinese who returned to China increased 56% over 2008 to **64,600**

  - In 2010 the number increased another 33% over 2009 to a total of **134,000**

    - Over 90% Chinese and 60% Indian returnees stated that economic opportunities at home were very important to their decision

    - Over 80% Chinese and 70% Indian returnees said opportunity to start a business was more favorable at home

  - In 2007 the total number of foreign PhD degrees **16,022**
    - 92% Chinese & 81% Indian PhD holders stayed at least 5 years

What progress have we made?

Is the U.S. more competitive today than 5 years ago?

- **Incentives for Innovation**
  - **U.S. global competitiveness** ranked **4th** in **2010-11 World Economic Forum, Davos**
    - 4th of 139 countries overall
    - 2nd in 2009-10 (until passed by Sweden and Korea)
    - 1st in 2008-09 and earlier (until passed by Switzerland)
  - **Global Innovation and Competitiveness** ranked by the ITIF in Feb 2009 (Information technology and Innovation foundation)
    - U.S. rank 6th of 39 behind Singapore, Sweden, Luxembourg, Denmark, and Korea
    - U.S. ranked 1st in 1999.
      - U.S. score ***increased*** between 1999 and 2009 but not competitively with increases in the other countries.

What progress have we made? Across the board: less competitive.

- **Rising Above the Gathering Storm committee *unanimously* concluded that the U.S. is less globally competitive today than it was in 2005.**

- Fallen backwards in all four RAGS recommendations.

- Earlier predictions underestimated the global rates of change.
  - China became the second largest economy in **2010**.
    - **2016** was predicted in the RAGS volume (published 2006)
  - International students are returning home because of more attractive working opportunities
  - Progress has been achieved in k-12 education, but our schools are less competitive

Summary

- U.S. has taken actions but they are too little, without long-term commitment, do not engage those responsible, and do not reflect an appreciation of the accelerating advancement of other countries.

- It is fair to conclude that a top-priority commitment to U.S. global competitiveness in science and technology is not U.S. policy.

- This is not an easy problem:
  - The four RAGS recommendations call for coordinated support from many different, disconnected and independent sources.
  - Regional and state actions are mandatory for many of the responsibilities are located there.

Outlook

- An “Approaching Category 5” storm is here because our nation does not yet comprehend the seriousness of its problem – we look inward and do not see:

  - accelerating global change

  - increasing global competitiveness

  - competition for global talent

- Simply put, we don’t get it yet.