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 bi-partisan **Senate** letter requesting response to specific questions on maintaining U.S preeminence in S&T in the 21st century.

• On June 30 NAS receive a bi-partisan **House** letter requesting response by September 30 **(90 days later)** to similar questions.

• Recognition that the prominent driver of the future **economy, security and quality of life** will come through **innovation**, largely derived from science & 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 actions of federal policy would **enhance the U.S. science and technology enterprise** so that the **Unites States can successfully compete, prosper, and be secure** in the global community of 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 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 responsibilities reaching into State and local issues, like k-12 education and regional innovation, and even to 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

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? 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.
- Slipped relatively backwards in all four 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)
    - **2025 was predicted** in by *Global Trends 2025*: (published 2008)
  - International students are returning home because of more attractive working opportunities
    - a quality the U.S. always cherished and considered its greatest attractor.
  - Progress has been achieved in k-12 education, but our schools are less competitive

What should we be doing?

- 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 to handle:
  - The four recommendations call for coordinated support from many different, disconnected sources.
  - Regional and state actions are mandatory for many of the responsibilities are located there.

What should we be doing?

- 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

- Our nation does not recognize its declining global positions in:

  - human capital

  - knowledge capital and

  - premier location capital

How about Global Competitiveness?

- **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 other countries.

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

2010-11 World Economic Forum (Davos)

- 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.

How about “Best and Brightest?”

- U.S. no longer the beneficiary of weak higher education systems and inadequate opportunities abroad that have driven the world’s highest-quality international students to study and careers in America.
- As those deficiencies abroad decline and opportunities there 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.

How about "Incentives for Innovation"

- 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 (**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

What progress have we made?
Is the U.S. more competitive than 5 years ago?

- K-12 Science and Math: 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)
  - Shanghai: scored **1st** in each subject and **1st** overall.
  - South Korea: **1st** OECD country, below avg per capita income
  - U.S.: avg OECD country; **1st** per capita income

What progress have we made?

Is the U.S. more competitive 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 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 **0.34%** GDP country avg
  - 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 than 5 years ago?

- **Best and Brightest**
- Higher education globally is under great stress
- Everywhere higher education is in expansion mode
- 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 is fierce and can only get more intense.