Why Manufacturing Matters:

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Global Innovation Reality

- Innovation is Key to Growing and Maintaining a Country's Competitive Position and to Addressing Global Challenges
- A strong manufacturing sector is widely seen as key to employment and national competitiveness, and technological security
- National and Regional Governments around the world support both innovation and manufacturing
- Foreign industrial policies play an instrumental role in shaping the terms of global competition

Why does Manufacturing Matter?

- Manufacturing:
  - Fosters Economic Growth
    - U.S. manufacturing produces $1.6 trillion of value each year
  - Is an key Source of Employment
    - Manufacturing supports an estimated 18.6 million jobs in the U.S.—about one in six private sector jobs.
  - Strengthens our Nation's Technological Capacity
    - U.S.-based manufacturers conduct half of all private R&D done in the United States.
  - Improves Competitiveness and Security
    - It provides goods for export, and the Currency Earnings that come with exports, to maintain national economic independence

Source: National Association of Manufacturers, 2009

Advantages of Foreign Manufacturers

- Low cost of Capital
- Low cost of Labor
- Regulatory Ease
- Relatively Closed Home Markets
- Capture of International Organizations (e.g., WTO)
- Well funded National Programs to Support Manufacturing, Capture IP, and Leverage Home Markets

China's Strategy is Simple:

The Leadership is Focused, Committed and Willing to Spend to:

- Acquire Technological Capabilities
- Develop Universities to Develop Next Generate Technologies and Workforce
- Support the Growth of New Industries
- Provide Jobs for "Off the Farm" Migrants
- Drive Exports, Accumulating Reserves
- Make Acquisitions of Foreign Assets

In short, the Goal is to Build National Power

Competitiveness Then and Now:

Japan:

- High-value, high-wage, advanced tech - "just like us"
- US entrepreneurial advantage, Japanese Industrial Policy advantage
- Rule of Law
- IP Protections
- Subsidized currency, buying our debt
- National Security: allies

Modified from Bill Bonvillian, et al.

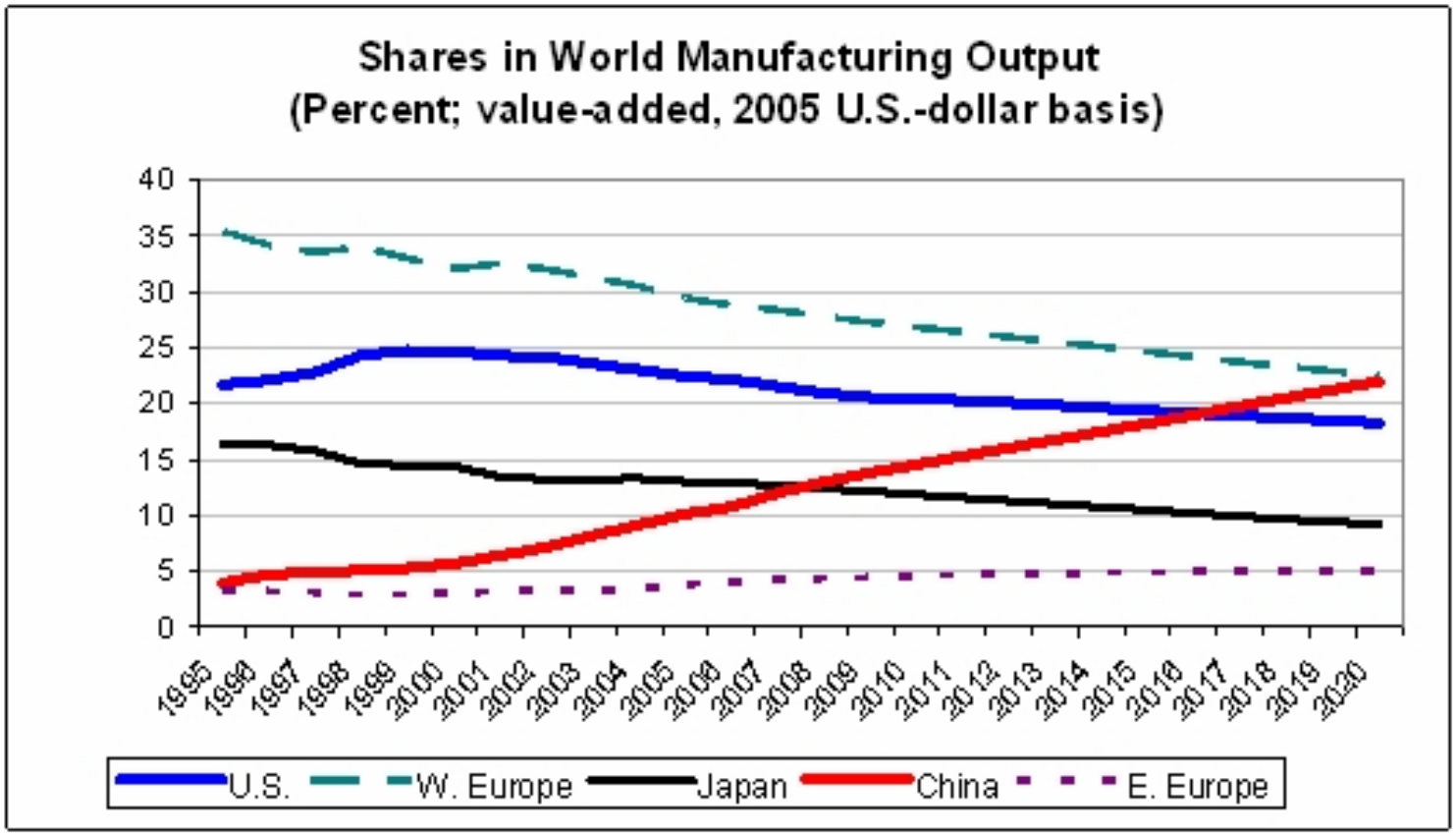
China: New Mix

- Low-value, low-wage, advanced tech
- Entrepreneurial
- Using Industrial Policy
- Limited Rule of Law
- IP Theft model – FBI: $250b/year
- Subsidized currency, buying our debt
- Nat'l security – peer competitor

China's Industrial Strategy

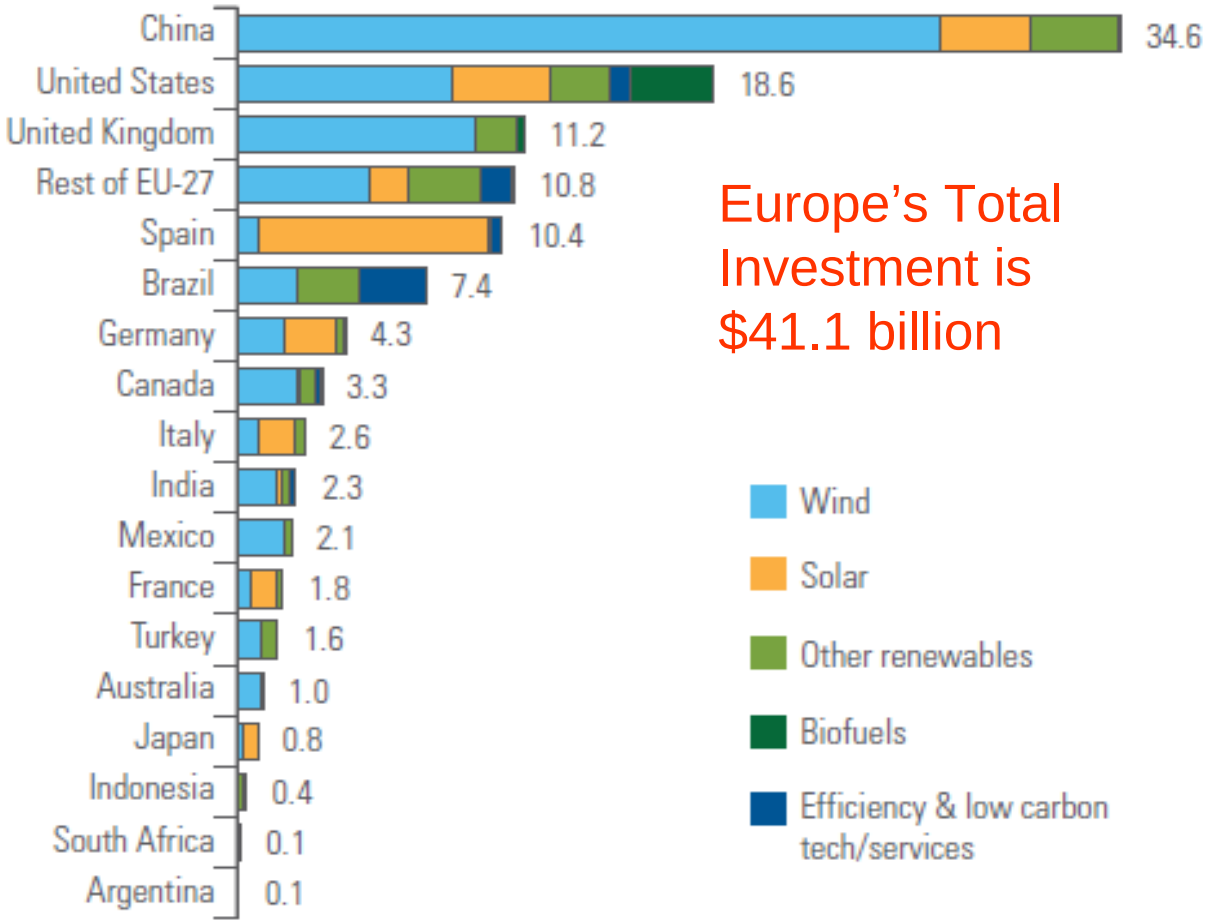
- Start with labor-intensive processes, where China can take advantage of its low labor costs
- Use conditional access to large and growing Chinese market to acquire technology and knowhow
- Strategy has proved successful for a number of high-technology industries from Semiconductors to Displays
- What about Green Technologies?

Changing Shares of World Manufacturing Output



Source: IHS-Global Insight, 2008

Are we Investing Enough?
U.S. is 3rd in Global Race for Clean Energy



Europe's Total Investment is $41.1 billion

Clean Energy Investments by Sector among G-20 Countries in 2009

Source: Pew Charitable Trust, "Who's Winning the Clean Energy Race?" March 2010

With manufacturing leaving the country, the United States runs the risk of losing the strength of its innovation infrastructure of design, research and development and the creation of new products and industries

Conclusion of the President Bush's Council of Advisors on S&T- 2003 Report

Should the U.S. Support Manufacturing?

Should we pick “winners and losers”?

What does History Show us about the U.S. Government Role?

- 1798 - Grant to Eli Whitney to produce muskets with interchangeable parts, founds first machine tool industry in the world
- 1842 - Samuel Morse receives award to demonstrate feasibility of telegraph
- 1903 – Wright Brothers fly, fulfilling the terms of an Army contract!
- 1915 – National Advisory Committee for Aeronautics instrumental in rapid advance in commercial and military aircraft technology

More Recent History of Picking Winners

- 1919 – Radio manufacturing (RCA) founded on initiative (equity and Board Membership) of U.S. Navy with commercial and military rationale.
- 1925 – U.S. Postal Act launched U.S. Aircraft Industry
- 1940s, ’50s, ’60s – Radar, Jet Aircraft, Computers, Satellites, Nuclear Energy, Semiconductors
  - Government-supported industries are “the Foundations of the Modern Economy,” Cohen & Noll
- 1969-1990s - Government investment in forerunners of the Internet (Arpanet) and establishment of the Global Positioning System
- 2000s – Focus on Nanotechnologies, Flexible Electronics, Biomedical Research

Government Role in Innovation

- Listening to some Americans critical of the government's role brings to mind the Jewish patriot criticism of the Romans in the Monty Python film "Life of Brian". "

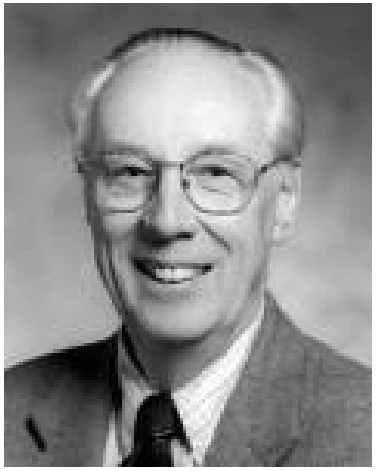
  – The Economist, May 1, 2004

  – But what, apart from the roads, the sewers, the medicine, the Forum, the theater, education, public order, irrigation, the fresh-water system and public baths... what have the Romans ever done for us?

(and the wine, don't forget the wine...)

History vs. Belief: A More Serious Perspective

- "Government has played an important role in the technology development and transfer in almost every US industry that has become competitive on a global scale."
  - *Technology, Growth and Development: An Induced Innovation Perspective* (2001)



Vernon Ruttan

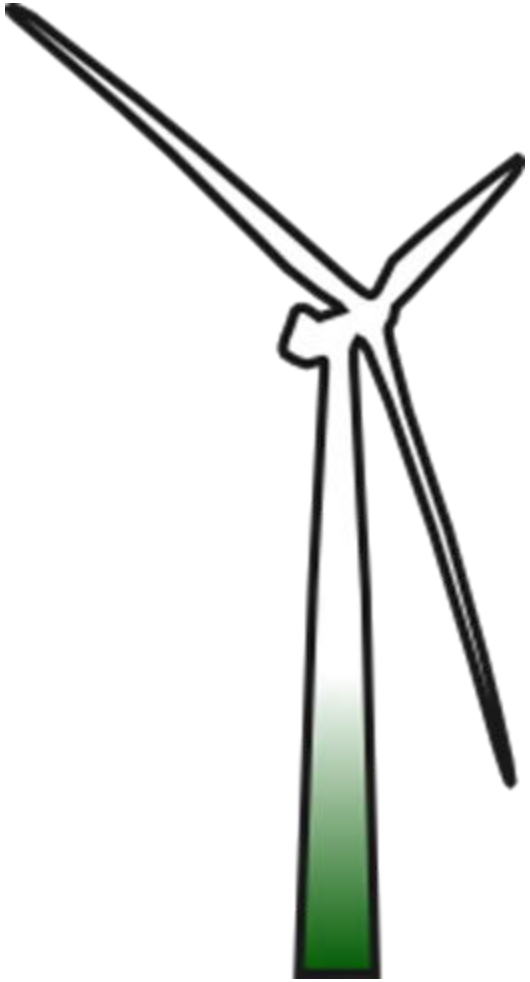
Emeritus Professor

University of Minnesota

Current Initiatives to Spur Manufacturing in the U.S.

Focus on Wind, Solar, Batteries

Stimulus Boost for Wind Energy



- Extends the tax credit for producing electricity from wind for three years through 2012
- Provides **$6 billion** in loan guarantees for renewable energy projects and electricity transmission projects
- Provides grants of up to 30 percent of the cost of building a renewable energy facility.
- Provides **$11 billion** in spending and loan guarantees to build a "smart grid"

Stimulus Funding for Solar and Batteries

- **$117 million** to expand the development, deployment and use of solar energy throughout the U.S.
- **$2.4 billion** in new grants for Advanced Battery Makers
- Major New Initiatives—My program at the NAS is Reviewing them for DOE

New DOE Loan Guarantee Program

- $750 million in loan guarantees for qualified projects to accelerate commercial use of new or improved green technologies
- Goal is to spur further investment in advanced green technologies.
- Overall goal is to sustain economic growth, yield environmental benefits, and produce a more stable and secure energy supply.

Better Solar and Wind: All Wait for the Demand Side!

- We have the Technologies
- We have the Companies
- We have the Workforce
- Do we have the Demand? We need:
  - Tax Incentives! - To drive Demand
  - Grants for Development and Deployment of new Technologies
  - Loan Guarantees and Tax Abatement for Manufacturing
  - Early Procurement from DOD and others is needed if we are to build production here

Where does the Real Money Go?

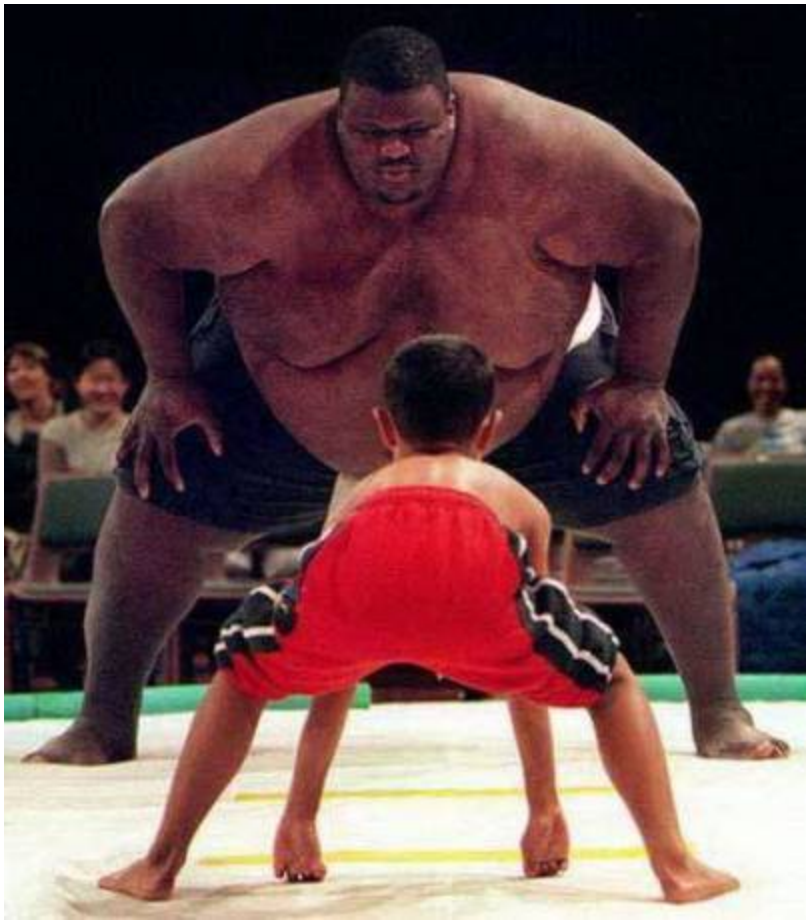
- Fossil Fuels
  - $72 Billion (2002-2008)
- Agriculture
  - $20 billion a year in direct subsidies to (very large) farmers
- Automotive
  - $25 Billion in loans to GM and Chrysler

Challengers vs. Incumbents

Traditional energy interests dominate the debate and skew policy in their favor.

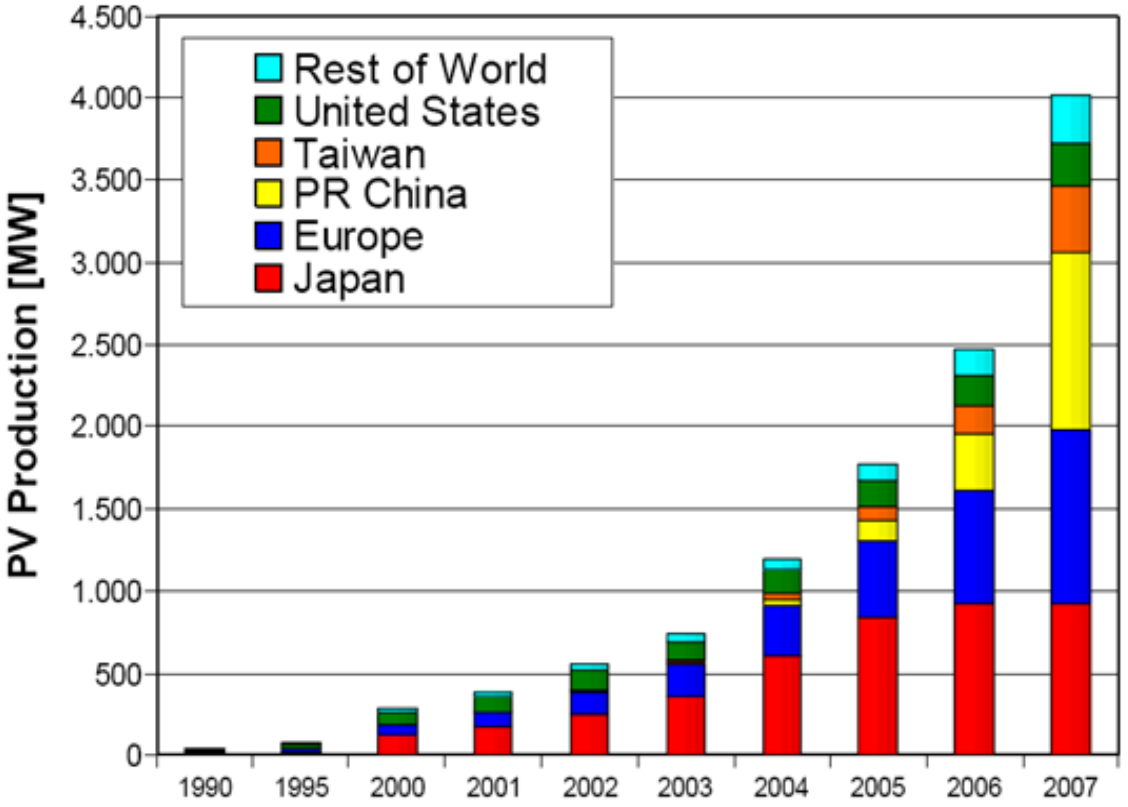
Renewable energy lobbyists are outnumbered **10 to 1** by traditional energy interests.

Source: The Center for Public Integrity
http://www.publicintegrity.org/investigations/climate_change/



And the Industries of the Future? The U.S. is Trailing in PV

- The U.S. trails other nations in the manufacture and installation o PV modules



What must the U.S. do?

We need to Support Manufacturing in the U.S.

Support for Manufacturing:
How does the U.S. Compare?

- **China's Indigenization Program**
  - Leverages China's large market to force foreign firms to hand over trade secrets and patents
  - At the same time, excludes foreign firms from government procurement (many domestic firms are state-owned/controlled)
- **Germany's Franunhofer Institutes**
  - Huge €1.6 billion budget every year
  - Dense network of 59 well-funded, well-staffed Institutes of Applied Research
- **The U.S. Manufacturing Extension Program**
  - Modest $125 million budget—recently increased
  - National network provides knowledge and problem-solving services to U.S. manufacturers, particularly small manufacturers.

What do we need to do?

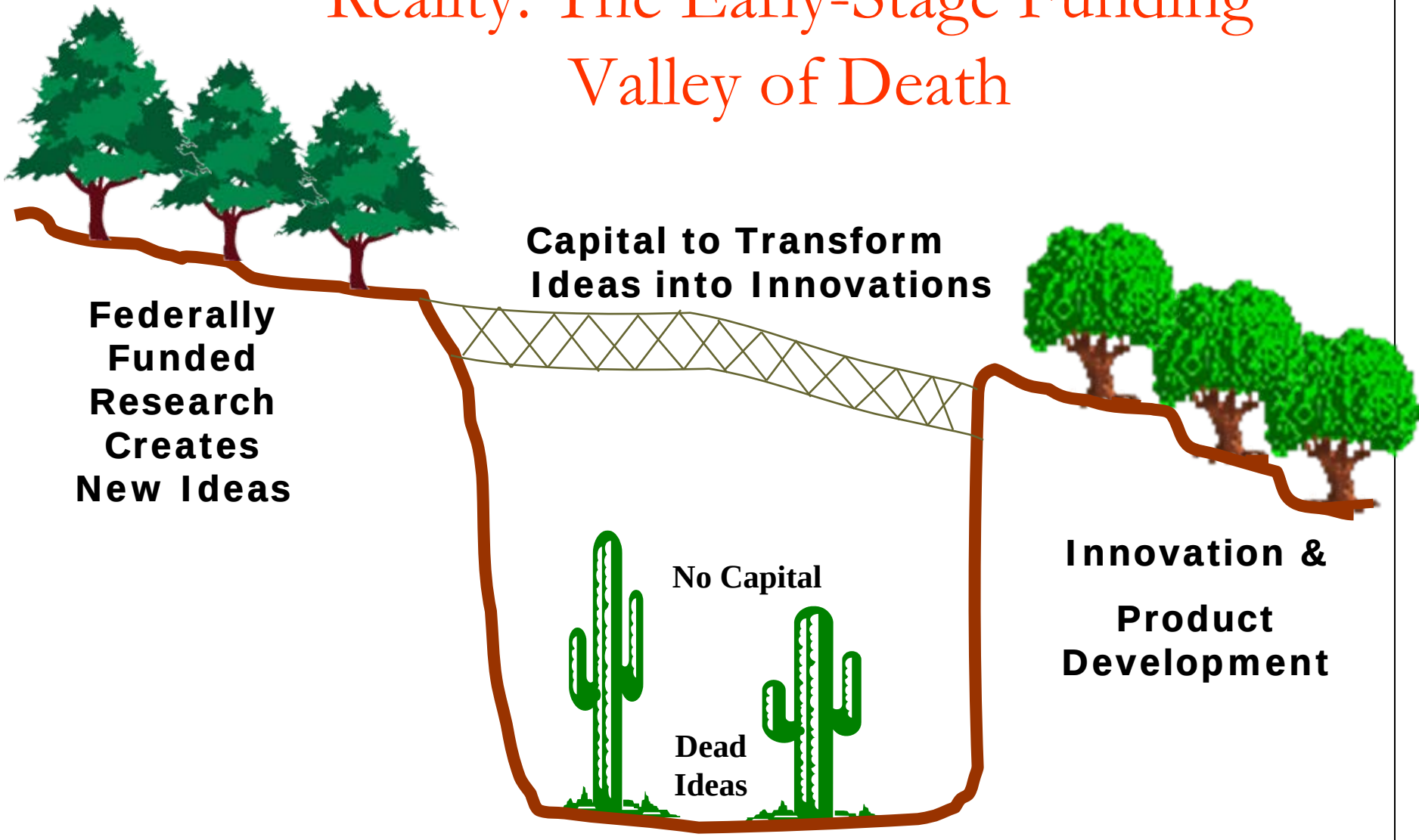
First, Get by the Myths

Then, Strengthen the U.S. Innovation Chain

The U.S. Myth of Perfect Markets

- Strong U.S. Myth: “If it is a good idea, the market will fund it.”
- Reality:
  - Potential Investors have less than perfect knowledge, especially about innovative new ideas
  - “Asymmetric Information” leads to suboptimal investments
    - George Akerlof, Michael Spence and Joseph Stiglitz received the Nobel Prize in 2001, "for their analyses of markets with asymmetric information“

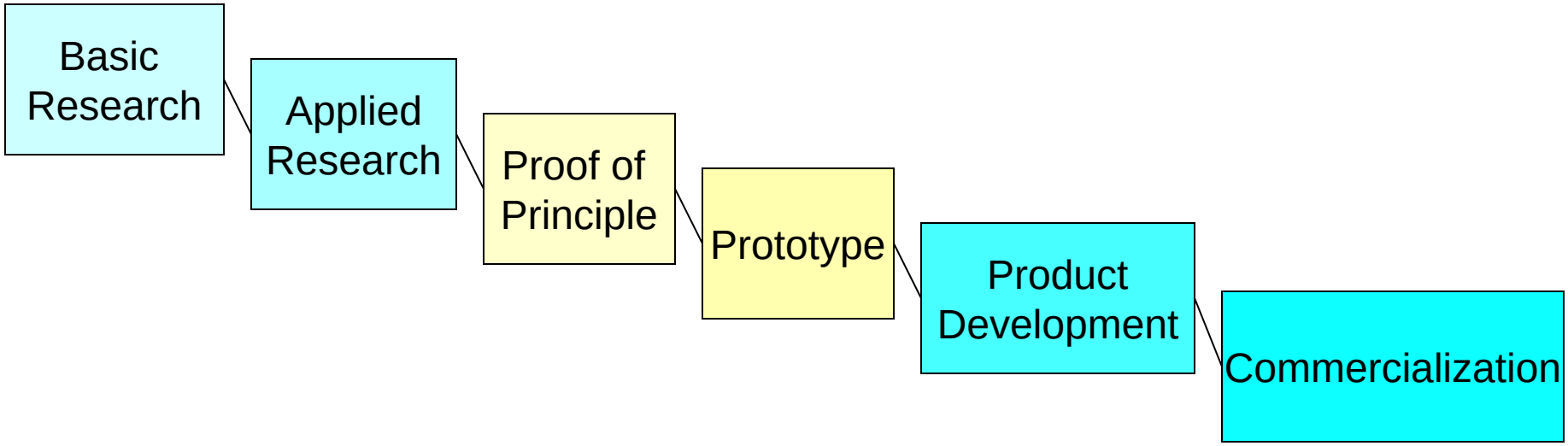
Reality: The Early-Stage Funding Valley of Death



The Myth of U.S. Venture Capital Markets

- Myth: "U.S. VC Markets are broad & deep, thus there is no role for government awards"
- Reality: Venture Capitalists have
  - Limited information on new firms
  - Prone to herding tendencies
  - Focus on later stages of technology development
  - Most VC investors seek early exit

The U.S. Innovation Chain



- The Proof of Principle and Prototype stages of the Innovation Chain face serious “Valley of Death” Financial Challenges
- The weakest links need attention, both for small and large companies

How Can Government Help?

- By substantially increasing funding for Research, including cooperative research with industry
  - Government funding for R&D through universities, national labs, and consortia
  - More focus on work-related education—e.g., the "Green Collar" workforce
- By helping to finance new ideas across the Valley of Death
  - Renew and fund proven programs, like SBIR and the Technology Innovation Program, to accelerate new technologies towards the market
  - Add new programs like loan guarentees
- By setting National Standards
  - e.g., for Renewable Energy and Smart Grids

How Can Government Help?

- By Stimulating Demand
  - Government can stimulate demand through procurement
  - Government can stimulate consumer demand through tax credits
  - Feed in tariffs or other incentives can quickly develop critical mass
- By Providing Funding Support and Incentives
  - Between 1943 and 1999 the nuclear industry received over $145 billion in federal subsidies
  - By contrast, the solar power industry received some $4.4 billion
    - Source: New York Times, May 23, 2005

The Flexible Electronics Opportunity

- We need to secure the future of research, development and manufacturing of this new technology in the United States

- To address this opportunity, the National Academies is convening a symposium on "Flexible Electronics for Security, Manufacturing, and Growth in the United States
- NAS Goals are to:
  - describe the potential of the flexible electronics industry,
  - review of international programs to support this industry, and
  - discuss industry's needs and the
  - steps that we should take to ensure the competitiveness of the United States in this important new technology.

Conclusions

Manufacturing Matters for Jobs, Growth, and Innovative Capacity

This requires Substantial and Sustained National Investment

Sustaining U.S. Manufacturing

- Comparative advantage in manufacturing is a product of substantial national investment and sustained effort
  - There are no permanent national advantages
- Manufacturing is both high-wage and R&D intensive
  - Germany and Japan are high-wage exporters
  - We need a strong manufacturing sector if the U.S. is to remain an Innovative Nation
- We should join the rest of the world in building a strong manufacturing sector

Save the Date

The National Academies Symposium

"Flexible Electronics for Security, Manufacturing, and Growth in the United States."

September 24, 2010

National Academies Keck Center

500 Fifth Street NW

Washington DC

Thank You

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