T he Innovation Imperative

Global Strategies for Competitiveness

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What is Innovation?

Innovation is the Successful Transformation of New Ideas into Products, or Known ideas into New Products

Why must we Innovate?

- **To Grow our Economies,**
- **To become More Competitive,**
- **To provide a Future for our Children**
- **To ensure our National Security, and**
- **To Address Pressing Global Challenges that affect us all**

The Global Innovation Imperative

- **Key Points**
  - **Innovation is how nations and regions compete in the 21st Century; we need to compete and win**
  - **Collaboration among Small and Large Businesses and Universities is Essential to Capitalize on Investments in Education and Research**
  - **New Partnerships among Government, Industry, and Universities are needed to foster collaboration and innovation**

Leading Countries and Regions are Responding to the Innovation Imperative

- **They are providing four things:**
  - **High-level Focus**
  - **Sustained Support for R&D: Leveraging Public and Private Funds**
  - **Support for Innovative SMEs**
  - **New Innovation Partnerships to bring new products and services to market**
- **They are investing very substantial resources to create, attract and retain industries in a variety of sectors**

China's Drive for Innovation

Government with strong sense of national purpose that is

Focused, Committed, and Willing to Spend

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Innovation tops President Hu Jintao's economic agenda

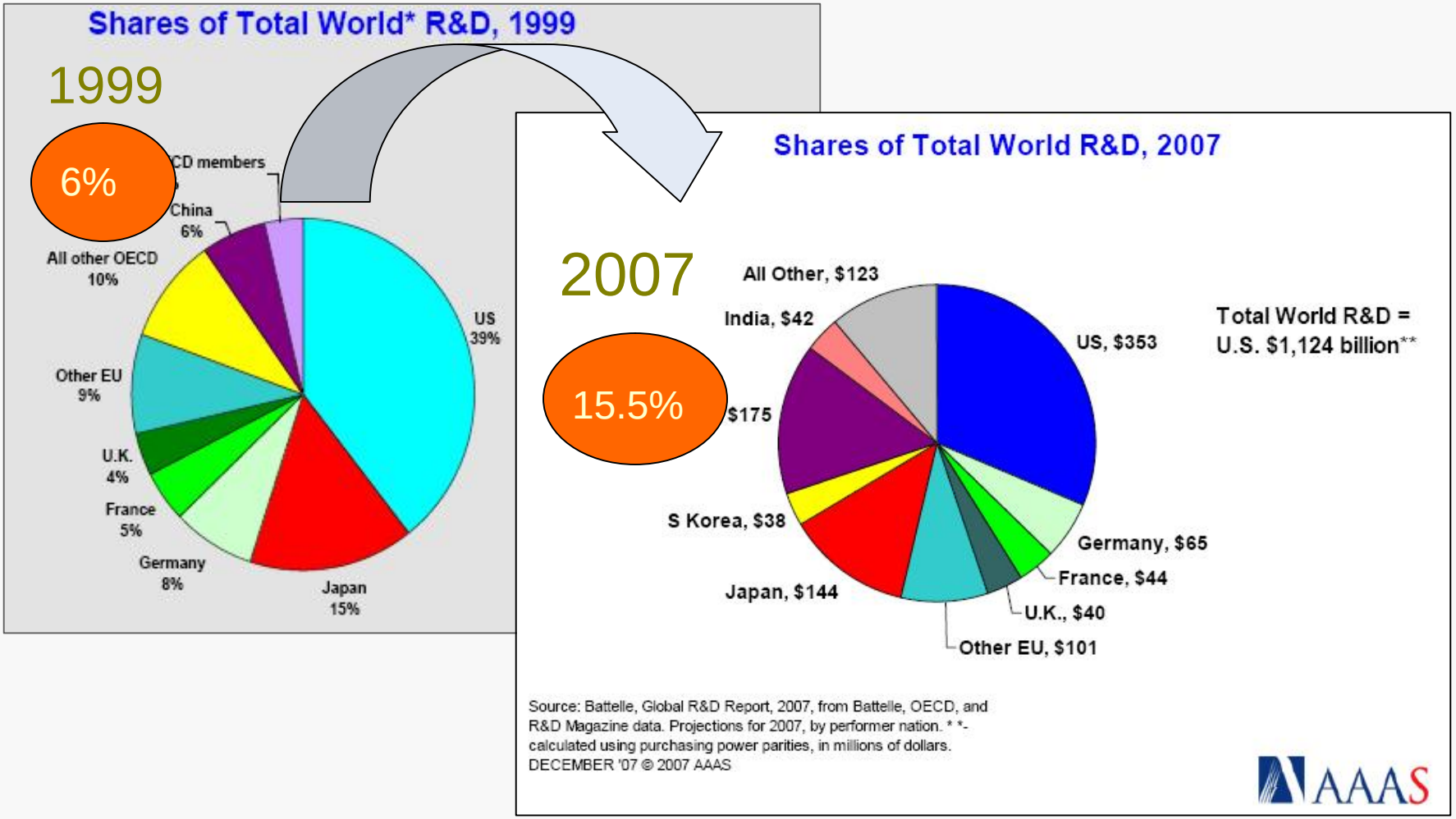
- **"Innovation is the core of our national development strategy and a crucial link in enhancing the overall national strength."**
  - **Report to the 17th National Congress of the Communist Party of China**

China's Goal: To Become an "Innovation-Driven Economy" by 2020

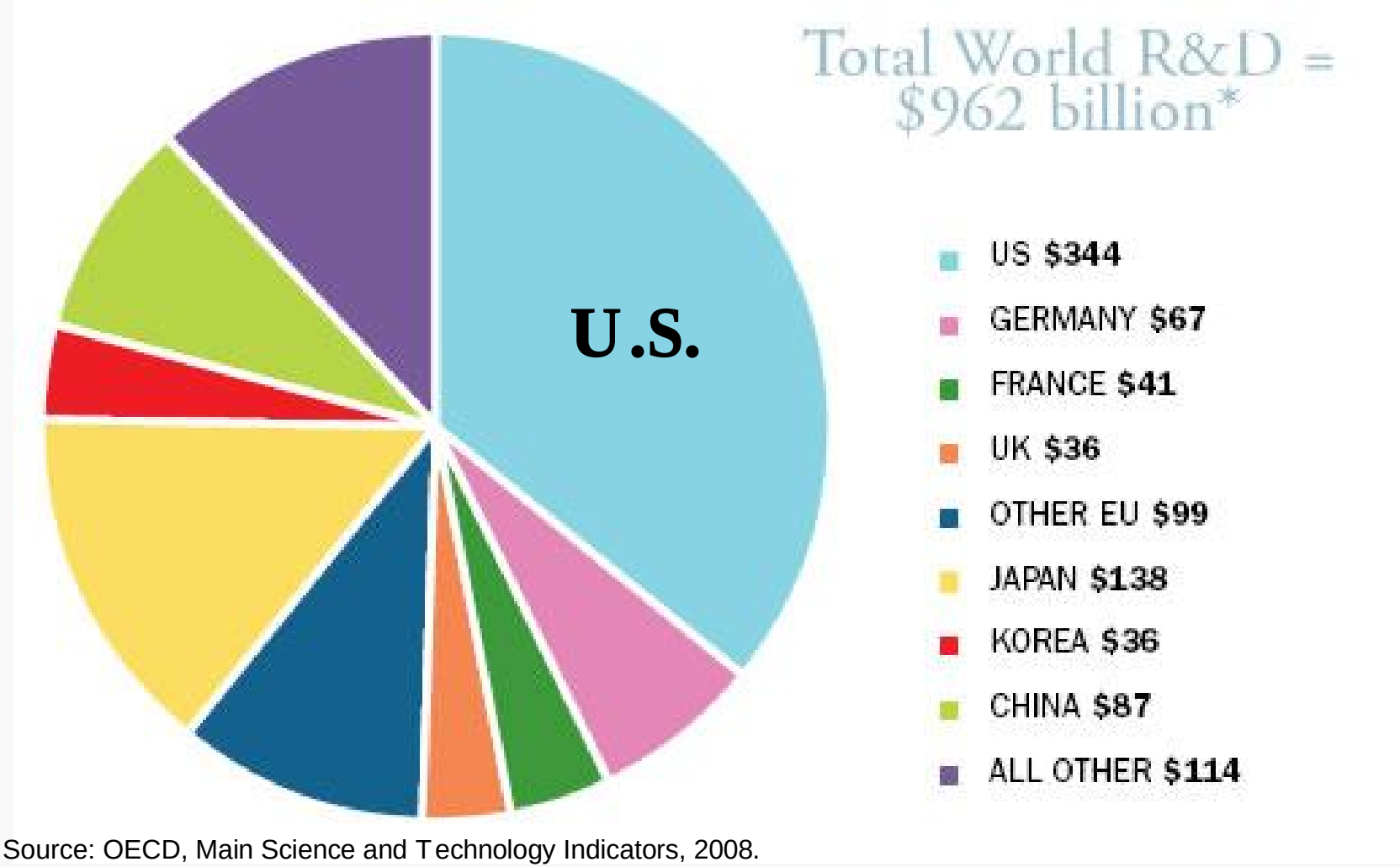
- **Boosting R&D Investments**
  - Expenditure on basic research doubled between 2004 and 2008
  - Tax incentives for enterprises that invest in R&D
- **Building R&D Infrastructure and Facilities**
- **Focus on building world class universities to create a Skilled Workforce**
- **Government procurement favors "Indigenous Innovation"**
  - Foreign-owned technologies targeted for "assimilation"
- **Financial Support for "Indigenous Innovation"**
  - Financing for large projects
  - Facilitating Credit and investment capital for SMEs

Source: Mu Rongpin, 2010 UNESCO Science Report

China's Share of Global R&D Surges

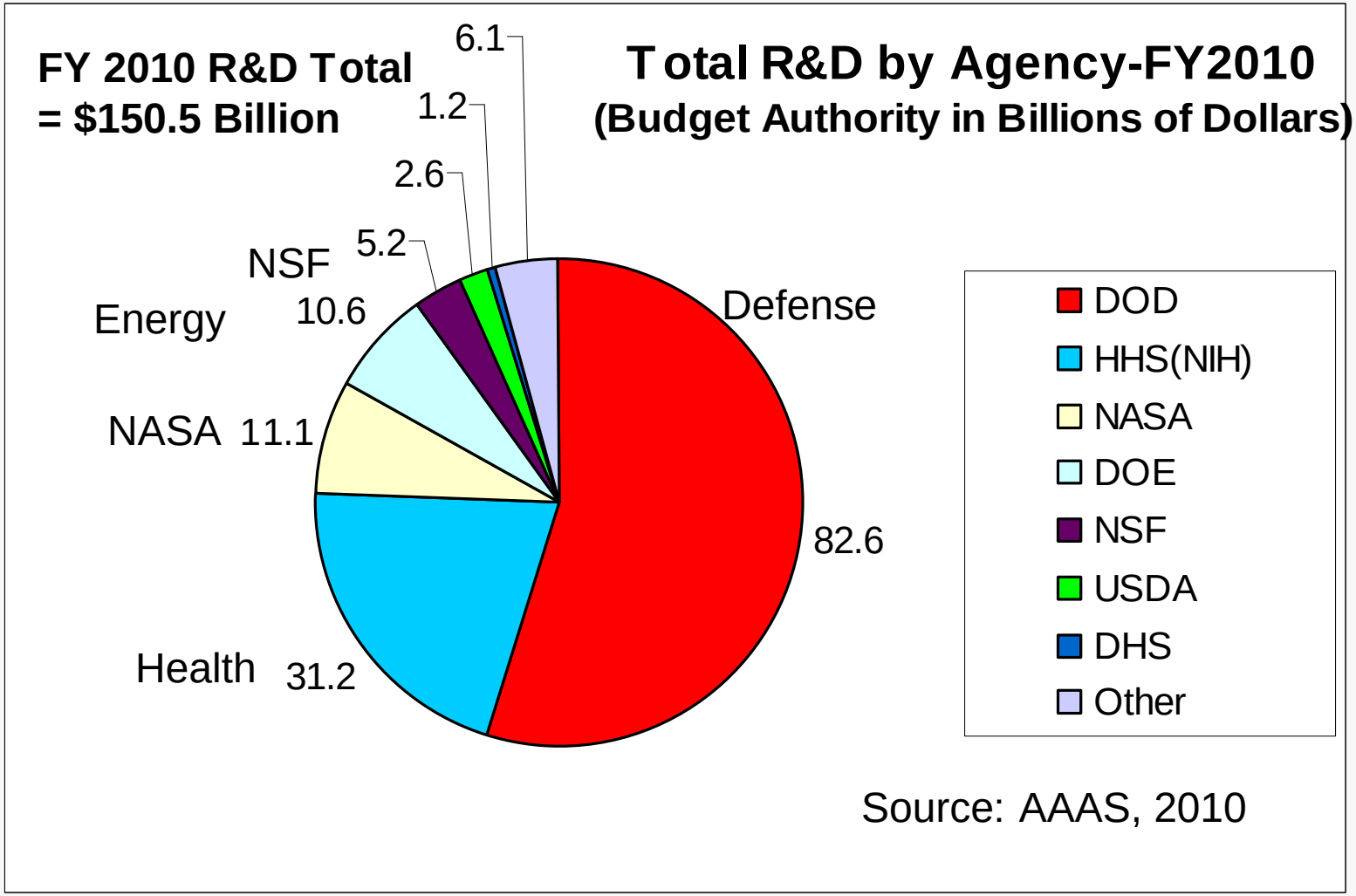


National Shares of Global R&D

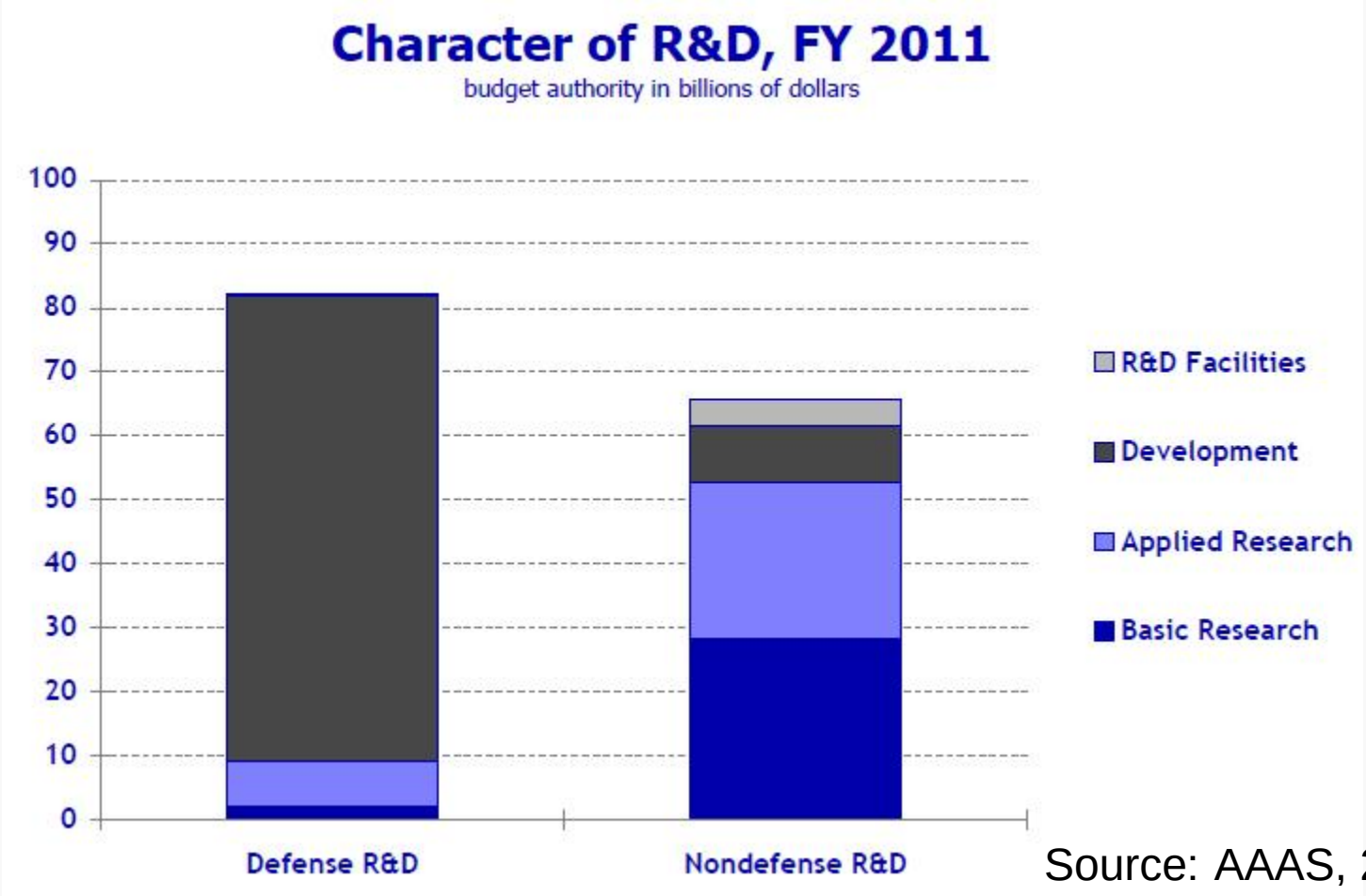


Source: OECD, Main Science and Technology Indicators, 2008.

U.S. Public R&D by Agency



~90% of Defense R&D Spending is for Weapons Systems Development



Source: AAAS, 2010

Other Emerging Economies are Also Focusing in Innovation

Brazil and Singapore show that Policy Focus and Sustained Investment can have important impacts

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Brazil's Innovation Strategy

- **Strengthen the National Innovation System**
  - **Reinforce National S&T institutions**
  - **Invest in a skilled workforce**
  - **Support S&T infrastructure**
- **Promote innovation in enterprises**
  - **Financial and Technical support for innovative firms**
  - **Provide incentives to start-ups**
- **Increase R&D in strategic areas**
  - **Bio, Nano, Health, Biofuels, Space, and Nuclear**
- **Use S&T and Innovation for social development**

Source: Secretary Francelino Grando, Presentation at February 2010 National Academies Symposium on "Clustering for 21st Century Prosperity."

Brazil's Growing Achievements

- **A growing knowledge workforce**
  - **The number of master's degrees awarded annually has doubled, to 36,014 between 2000 and 2008**
  - **Growth of technology schools from 140 to 366 between 2002 to 2010**
- **More knowledge created**
  - **From 10,521 scientific articles in 2003 to 30, 415 in 2008**
- **More R&D Expenditure**
  - **Public and private R&D investment has soared from $8.7 billion in 2000 to $24.4 billion in 2008**
- **FINEP (the Innovation Agency) invests $2 billion per year to Finance Innovation**

Source: Secretary Francelino Grando, Presentation at February 2010 National Academies Symposium on "Clustering for 21st Century Prosperity."

Its not just Size but Focus!
Singapore's Innovation Strategy

- **Total Focus, Commitment, and Long-Term Spending by the Government**
  - Goal is to establish Singapore (population: 4.5 million) as Southeast Asia's preeminent financial and high-tech hub.
- **A*STAR's task, with $5 Billion in funding is to:**
  - Invest in and attracting a skilled R&D workforce
  - Attract major investments in pharmaceuticals and medical technology production
  - Invest in Public Private Partnerships
    - New S&T Parks—Biopolis & Fusionopolis
  - Develop new programs to address the early-stage funding challenge for innovative firms
- **Generating local entrepreneurs and firm growth remain challenges**

Our Traditional Competitors are also Responding to the Innovation Imperative

Japan and Europe are Reinvesting and Reforming

Japan has Undertaken Significant Reforms of its Innovation System*

- **1995 Basic Law on S&T**
  - Reformed SME technology policy
    - Removed minimum capital regulations
    - Provides Financial support for start-ups
    - Reformed Bankruptcy Laws
  - Revamped the R&D Tax Credit
- **National Universities are now "Semi-Private"**
  - **Institutional Reforms have led to more industry-university cooperation**
  - **Budget increases have led to an improved research environment**

***Source: Nagaoka, Kondo, Flamm & Wessner (eds.) 21st Century Innovation Systems for Japan and the US (2009)**

Europe's Best Innovators are Changing

- **Finland, Sweden, the Netherlands, & France are among those**
  - **Making Substantial public R&D investments**
  - **Reforming university structures and public research institutes**
  - **Mobilizing private capital for start-ups and growth companies (eg. by providing "tax grants")**
  - **Introducing new partnership programs**
- **Many of these Strategies draw from successful U.S. Policies and Programs**

Germany's Strong Manufacturing

- **Germany is a high-wage, developed economy**
- **Yet, Manufacturing remains a National Priority, supported through…**
  - **Investments in job training**
  - **Investments in higher productivity to offset high wages**
  - **Assistance to small manufacturers in getting their products to global markets**
  - **Energy and transportation policies that have fostered a German edge in manufacturing**
    - **Everything from kitchen equipment, to high speed rail and wind turbines, to capital equipment**

Why does Manufacturing Matter?

- **Fosters Economic Growth**
  - U.S. manufacturing produces $1.6 trillion of value each year
- **An important 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 Expands U.S. Exports**
  - It provides goods for export, and the currency earnings that come with exports to maintain national economic independence
    - **The Germans understand this…**

Source: National Association of Manufacturers, 2009

German Manufacturers are even Succeeding in the Chinese Market

- **Rising exports to China are driving Germany's economic expansion**
  - Driving growth of both large and small manufacturing firms
- **German exports have jumped 17 percent this year, driven in large part by a 55 percent rise in overall exports to China**
  - Exports now account for more than one-third of Germany's national output, more than double the rate in the United States
- **Focus on manufacturing excellence make German products sought after**
  - Chinese consumers see them as superior to goods made in China

Source: Washington Post, "Made in Germany, Sold in China," September 17, 2010

What about the United States?

How are our Innovative States Responding?

New York and Michigan are powerful examples

- **They are:**
  - **Making significant Long-term Investments in emerging technologies**
  - **Fostering Collaboration between Industry and Academia**
  - **Developing innovation clusters**

New York's Nanotechnology Initiative

- **Over $2 billion in state investments are fostering research, investment, manufacturing, and jobs focused on nanotechnology and semiconductor manufacturing**
  - **Public-private research programs**
  - **Academic programs and state-of-the-art research laboratories at the State University of New York at Albany**
    - **Source: Pradeep Haldar, NAS Conference on Innovation Clusters, 2009**
- **Generated over $10 billion in Private Investment!**

Payoff for New York

- **Impact: More than $5 billion in investment have been drawn into the state**
  - **Companies such as IBM, AMD, Applied Materials, and Tokyo Electron are making significant investments in New York State**
    - **Source: Syracuse Post Standard, September 9, 2010**
- **Impact: Manufacturing and High Value Jobs are moving to New York State**
  - **One of America's only green field silicon wafer fabrication plants is being built near Albany by Global Foundries at a cost of $4.5 billion**
  - **Will provide the region with 1,400 new jobs.**
    - **Source: Wall Street Journal , December 3, 2010**

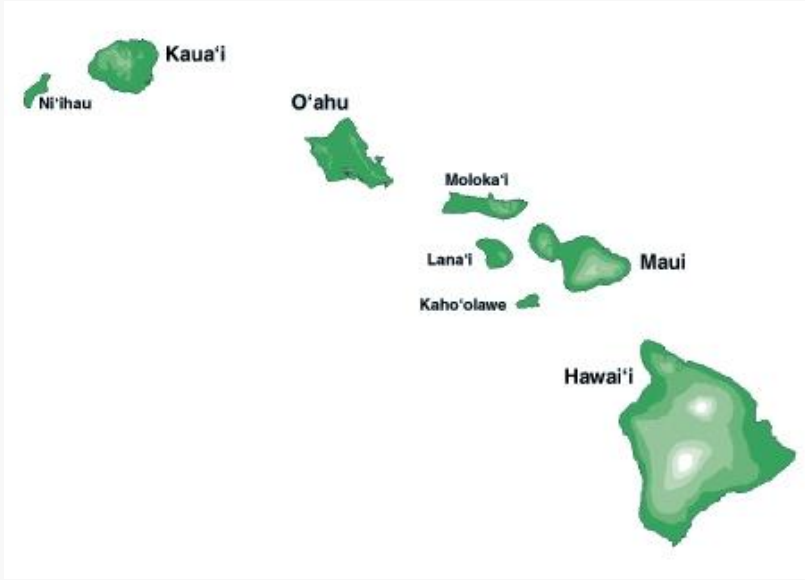
Michigan's Batteries Initiative

- **Objective:** **Ensure that the state's auto industry remains globally competitive in the coming era of electrified vehicles,**
- **Strategy:**
  - **Leverage Michigan's large advanced manufacturing and R&D base for automobiles**
  - **Invest more than $1 billion in grants and tax credits to manufacturers of lithium-ion battery cells, packs**
  - **Work with Universities and Community Colleges to develop workforce training programs**
    - **Source: NAS Conference on "Building the US Battery Industry for Electric Drive Vehicles," July 2010**

Payoff for Michigan

- **Michigan' s Challenge:**
  - **The state was experiencing the steady decline of the auto industry that has been the state's main employer for the last century**
  - **How do you begin to reverse this?**
- **Impact of Michigan's Battery Initiative**
  - **As of mid-2010, some 16 battery-related factories were being built in Michigan, projected to create 62,000 jobs in five years**
    - **Source: Michigan Economic Development Corp.**

How is Hawai'i Addressing the Innovation Imperative?



Hawai'i's Innovation Challenge

- **Hawai'i's leaders recognize the need to foster an innovation-based economy to secure the state's future**
  - **Grow per capita income**
  - **Diversify the economy**
  - **Become more energy secure**
  - **Foster and attract a young, skilled workforce**

Hawai'i's New Innovation Strategy

- **Dr. Greenwood and the *Hawai'i Innovation Council Report* have outlined what Hawai'i must do to innovate and grow**
  - **Key role of the University of Hawai'i in building a Knowledge-Based Economy**
- **Governor Abercrombie recognizes that innovation is key to the state's future—Leadership is Key**
  - **The Governor Campaigned on Encouraging start-ups and innovative small businesses, and**
  - **Support for technology development and commercialization**
- **Governor's Technology Council demonstrates this policy commitment**

No Need to Go it Alone:
Hawai'i can benefit from Synergies with Federal Initiatives

Hawai'i can benefit from new Push on Renewable Energy Technologies

Hawai'i can leverage Federal Technology Partnership Programs

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Hawai'i's Advantage: a President Committed to Science and Innovation

Science and innovation is "more essential for our prosperity, our security, our health, and our environment than it has ever been."

President Obama at the National Academies—April 27, 2009

Major Federal Investments in Renewable Energy

Wind, Solar, Batteries

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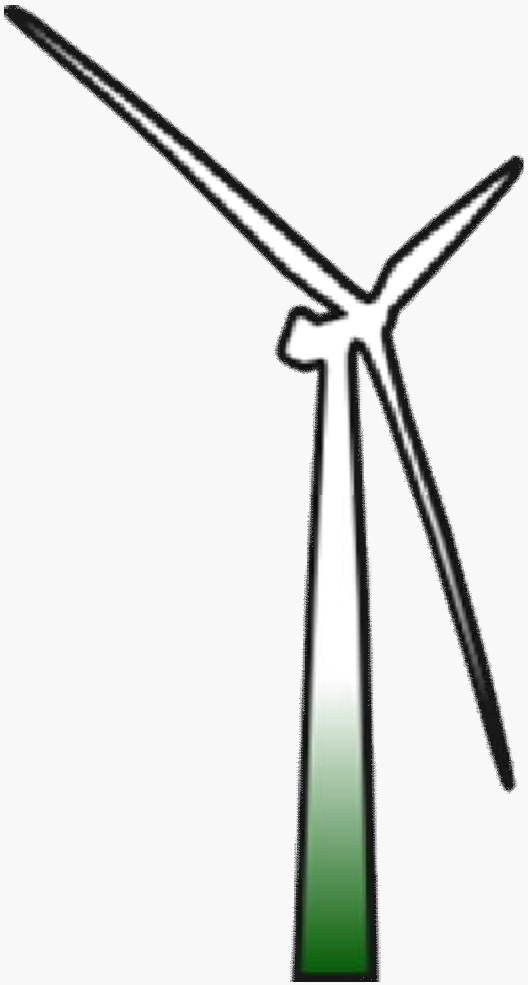
Stimulus Boost for Wind Energy

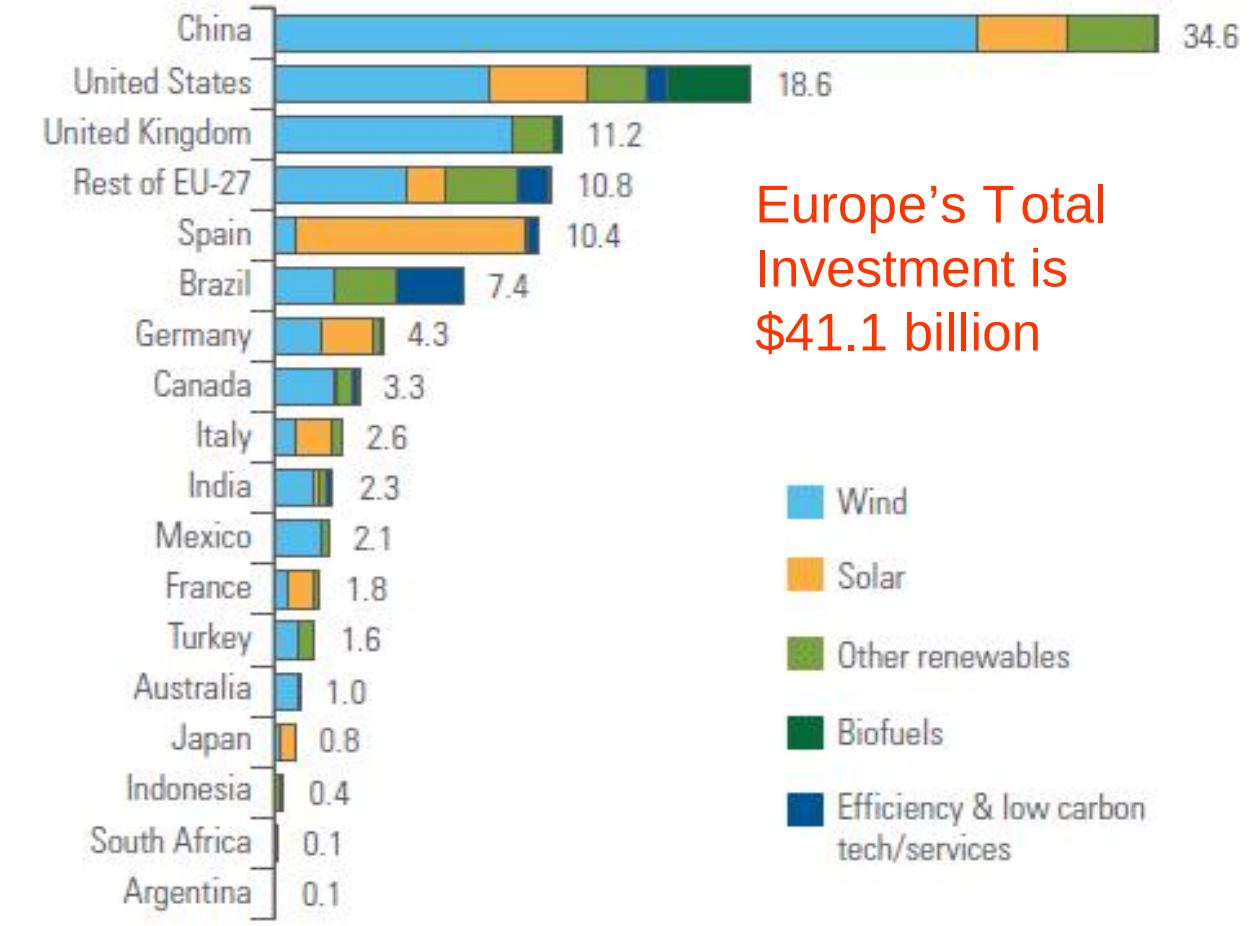


- **Extends the tax credit for producing electricity from wind for three years through 2012**
- **Provides $6 billion in loan guarantees for renewable energy projects and electricity transmission projects**
- **Provides grants of up to 30 percent of the cost of building a renewable energy facility.**
- **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**
- **Our NAS Program is Advising the Department of Energy**

But Is the U.S. Investing Enough? The 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

Solar and Wind: The Demand Side

- **We have the Technologies**
- **We have he Companies**
- **We have the Workforce**
- **Do we have the Demand? We need:**
  - **Tax Incentives: Federal and State**
  - **Grants for new Technology Development**
  - **Loan Guarantees and Tax Abatement for Manufacturing: A State Prerogative**
  - **Early Procurement—State governments can drive regulations and procurement**

Hawai'i can Benefit from Federal Investments in Renewable Energy

- **Energy Security is a Major Challenge for Hawai'i**
  - **Hawai'i meets 85% of its energy needs by burning petroleum**
- **Hawai'i is an ideal location to test and embark on transformative clean energy projects**
  - **Hawai'i Clean Energy Initiative envisions 30% energy efficiency and 40% renewable energy by the year 2030**
  - **Both of these goals are now codified within State law.**
- **Hawai'i has the opportunity to be both a lead innovator and early adopter of Electrified Vehicles, Wind Power, and Solar PV technologies**

The Role of Partnerships

- **Well Structured Innovation Partnerships Encourage Collaboration needed to Develop and Market New Ideas**
- **Proven Partnership Mechanisms Include:**
  - **Innovation Awards—SBIR**
  - **Industry-University Cooperation**
  - **University-Linked S&T Parks**
  - **Research Consortia—Sematech**

Small Companies Drive High-Technology Innovation

- **Small Businesses make many Contributions**
  - Grow Jobs
  - Increase Market Competition
  - Generate Taxable Wealth
  - Create Welfare-Enhancing Technologies
  - Over time, innovative small businesses (like Microsoft, Intel and Google) transform the composition of the economy
- **But myths about "Perfect Markets" are a barrier to policies that encourage small business innovation**

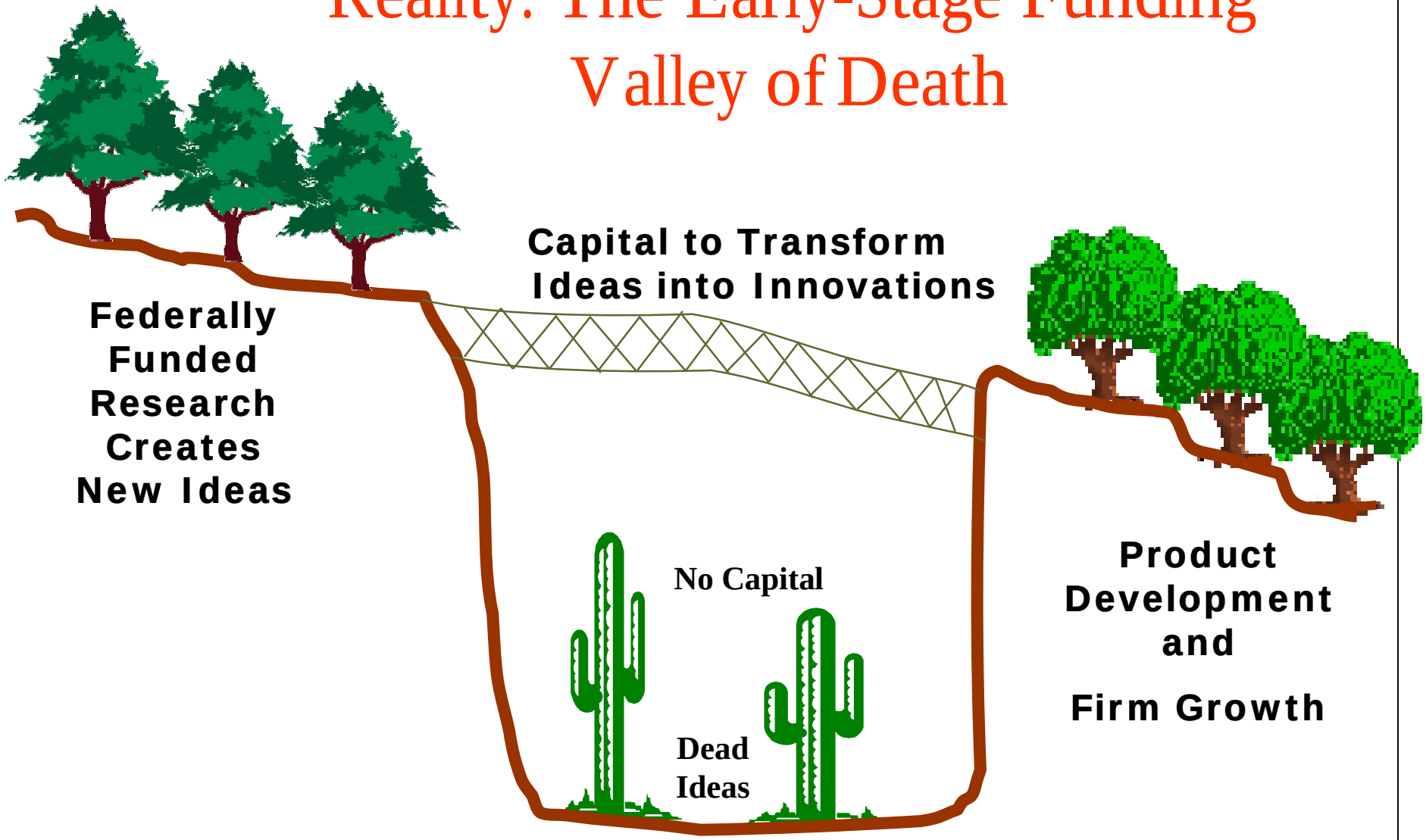
The Challenge:

Entrepreneurs with new ideas for innovative products face major challenges in bringing their ideas to market

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



What about Venture Capital?

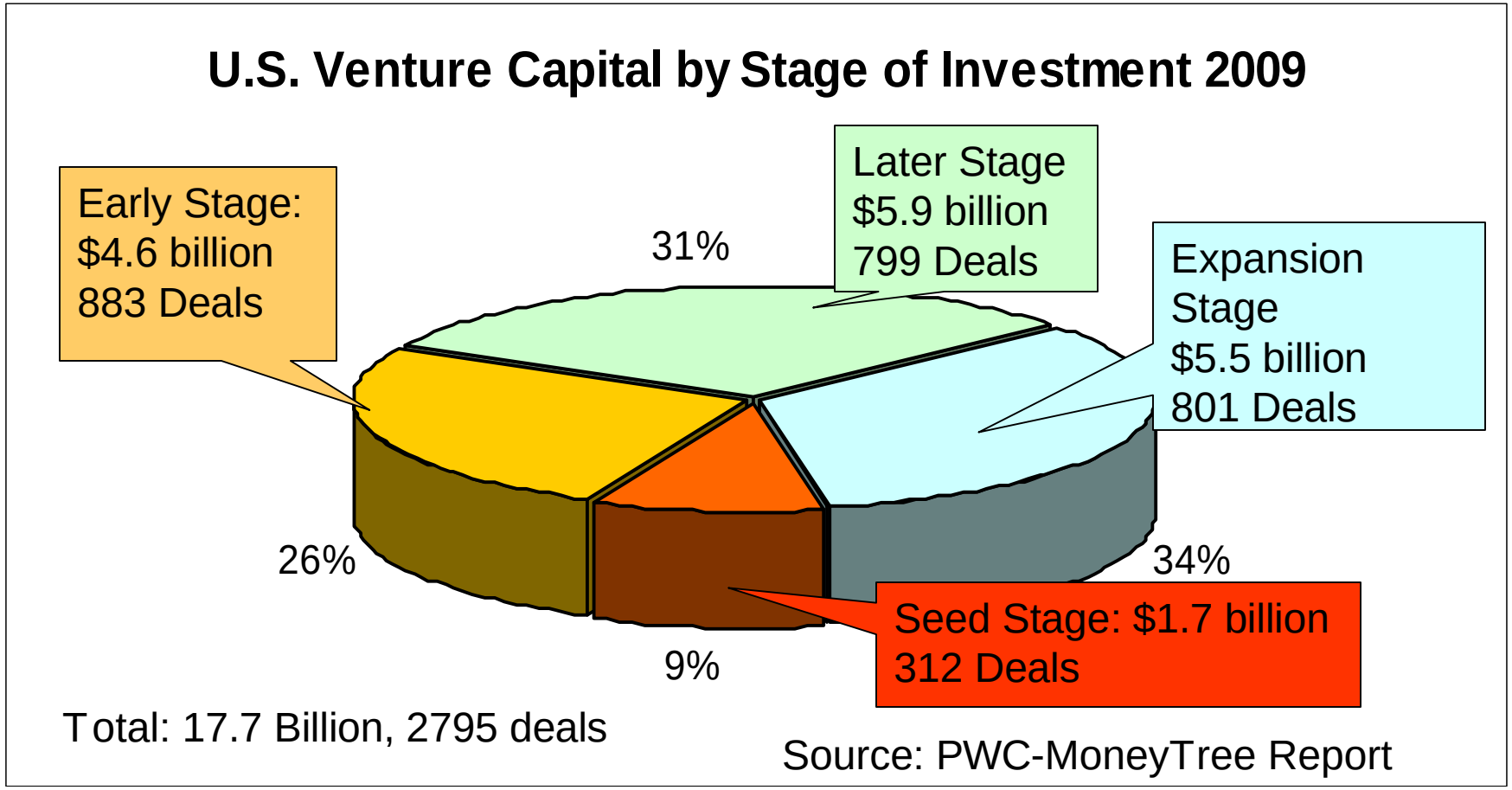
Is Venture Funding the Solution to the Valley of Death?

The Myth of U.S. Venture Capital Markets

- **Myth: "U.S. VC Markets are broad & deep, thus there is no role for government awards"**
  - **"If you have a good idea, a good team, and you sell it well, you will be funded"**
- **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**

Large U.S. Venture Capital Market is Not Focused on Seed/Early-Stage Firms

U.S. Venture Investments Down 37% in 2009



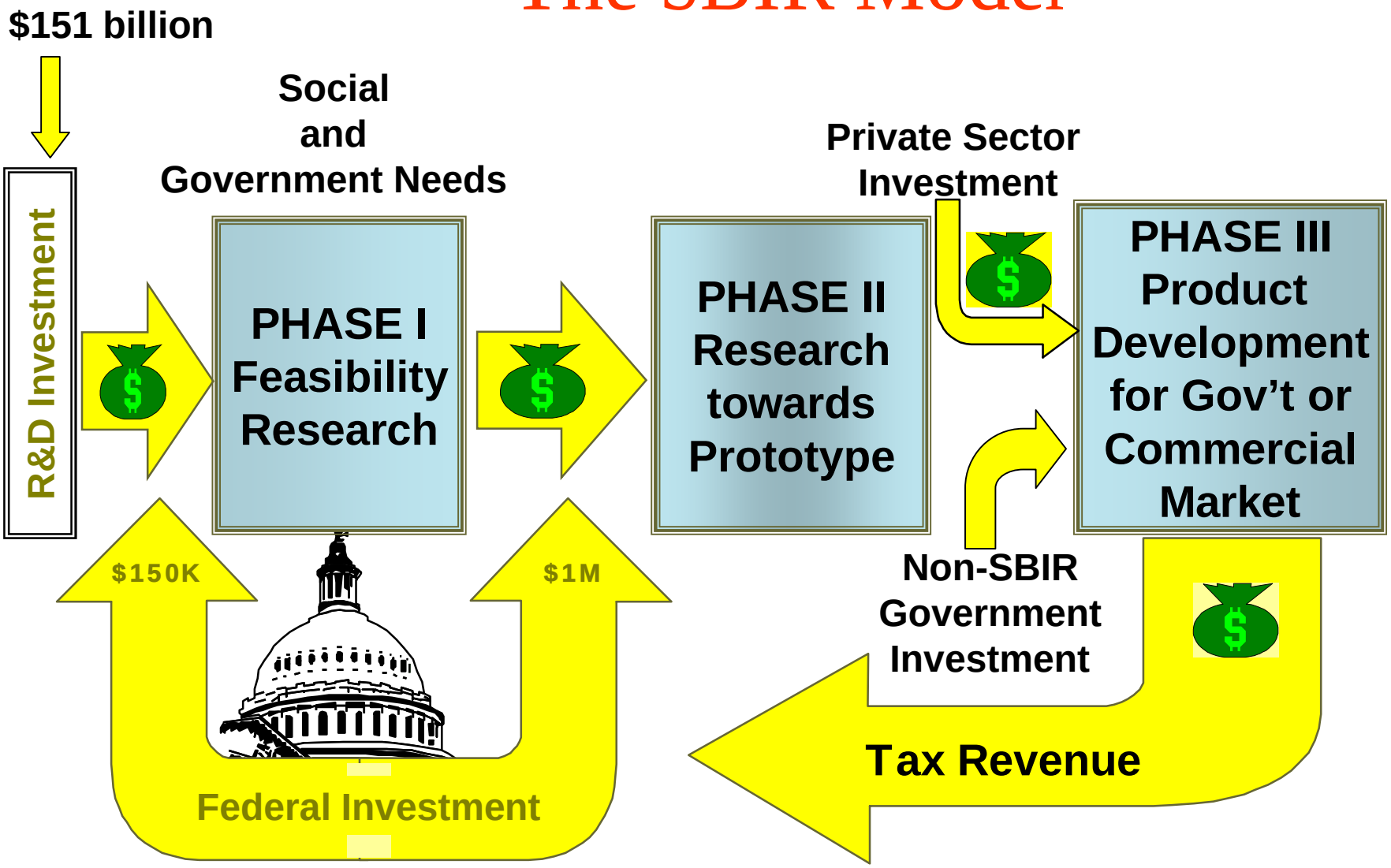
How can Innovative Small Firms Cross the Valley of Death?

There are Many Paths---the U.S. Small Business Innovation Research Program (or SBIR) is one Proven Path across the Valley

SBIR: Key Features

- **Long-Term and Large Scale: Largest U.S. Innovation Partnership Program:**
  - In place since 1982
  - Currently **$2.5 billion per year** drawn from **2.5% set-aside** on departmental or agency R&D budgets
- **Phased Award Amounts**
  - Small initial contract or grant: $150K
  - $1 million Phase II award for successful companies
  - Follow-on acquisition in Phase III or Private Investment
  - Speculation permitted
- **Needs driven: Participants vary**
  - Government missions addressed by start-up firms, contract researchers, and high-growth gazelles

The SBIR Model



Federal Programs Can Help (a lot)

- **SBIR gives "First Money" for New Companies—strengthens existing companies**
- **EDA provides grants to build out the Infrastructure: new initiatives underway**
- **S&T Parks to bring Universities and the Marketplace together**
- **DOE Consortia and Loan Guarantees to Jump Start new High-tech Firms**

Hawai'i can become a Center of Innovation for the Pacific

- **The New Innovation Council Study is a key step forward**
- **You have the Leadership**
- **You need Federal, State and Private Investments to Succeed**
- **State Initiatives and Investments are Essential as Catalysts for Progress**

Yes, you can!

- **An Innovative Hawai'i can…**
  - **Capture more benefits of investments in research, development, and higher education.**
  - **Build a stronger entrepreneurial culture.**
  - **Help existing industries modernize.**
- **Innovation is not a "Hobby"—it is a State and National Imperative!**
  - **Our children's future depends on it.**

Aloha

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