



Advanced and Clean Energy Manufacturing

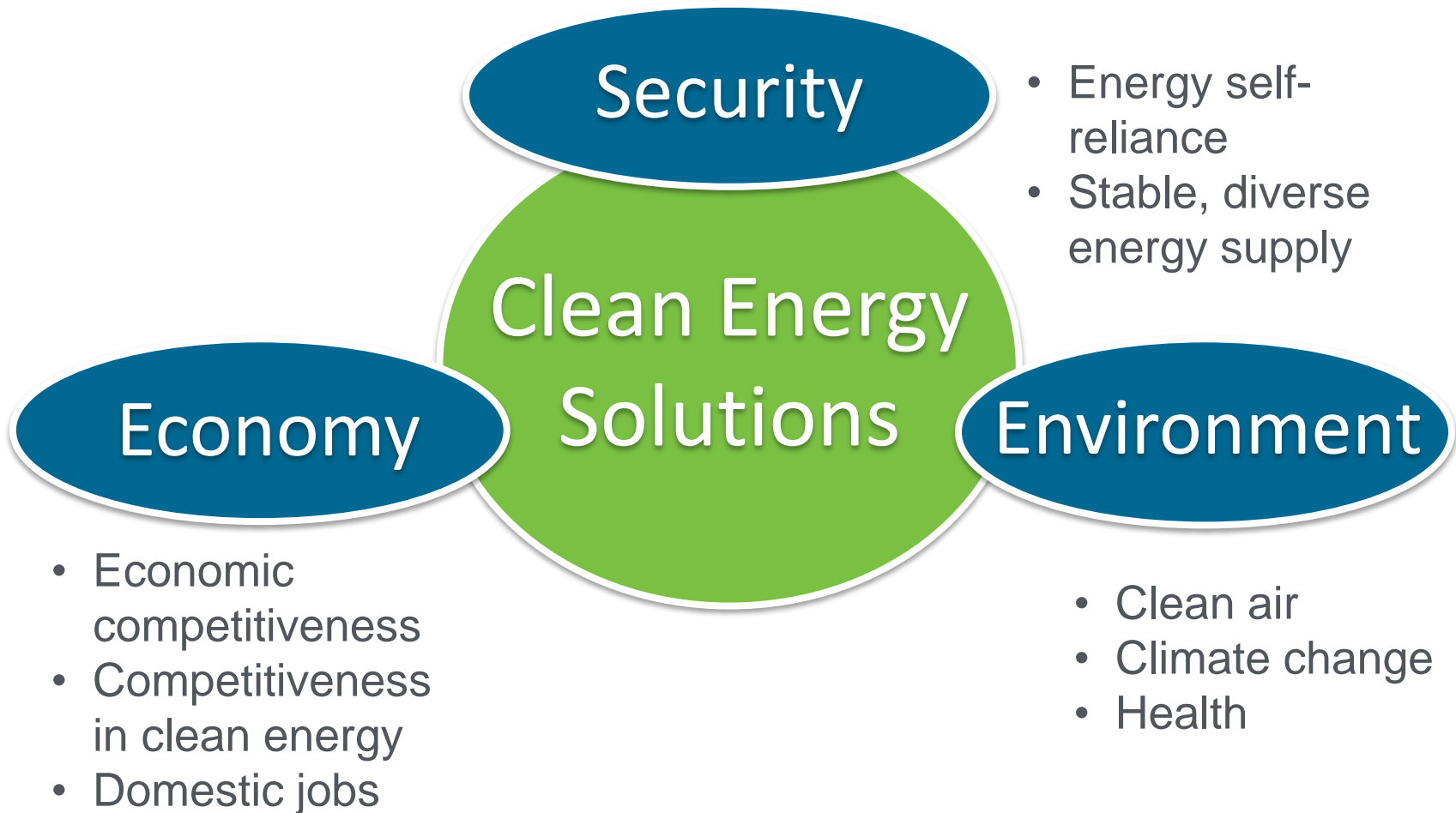
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Office of Energy Efficiency and
Renewable Energy

U.S. DEPARTMENT OF
ENERGY | Energy Efficiency &
Renewable Energy

Clean Energy: Top Administration Priority

Part of All-the-Above Strategy



Importance of Manufacturing

Manufacturing and...

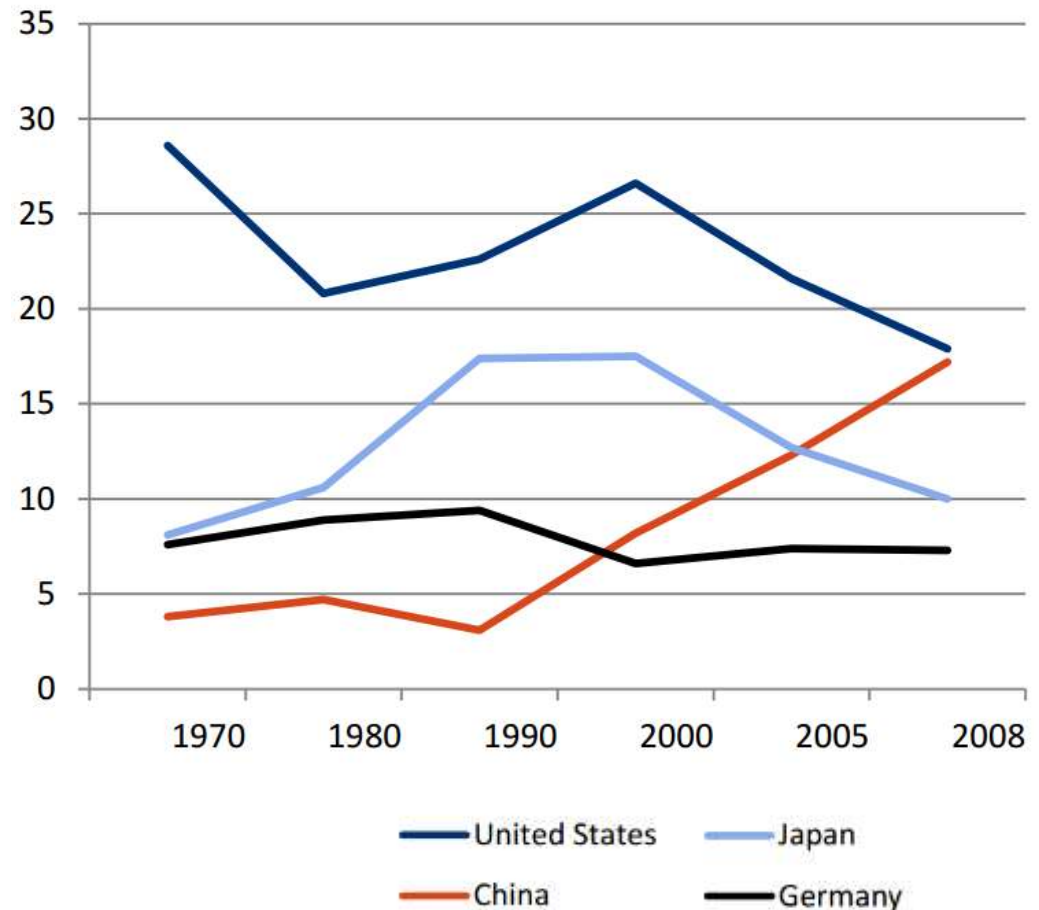
...the U.S. economy:

- 11% of U.S. GDP
- 57% of U.S. exports
- Nearly 20% of the world's manufactured value added.

...the U.S. workforce:

- 12 million high-paying U.S. jobs
- 60% of U.S. engineering and science graduates

Select Country Share of World Manufacturing Output, 1970-2008



Research & Development

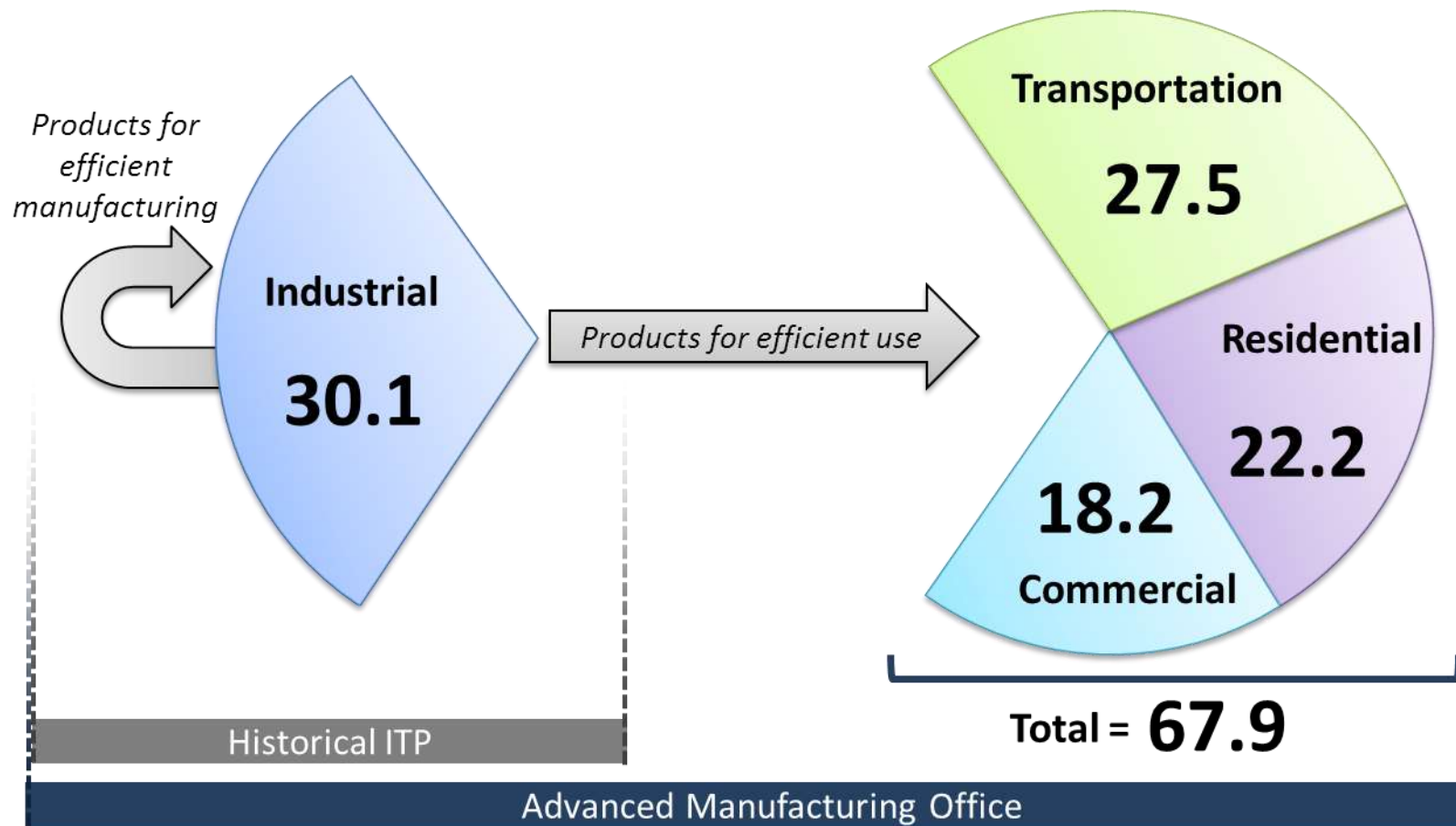
- Help U.S. win clean energy races
- Develop next generation technologies and systems at (lifecycle) costs competitive with current technologies
- Develop advanced processes and materials to enhance competitiveness of U.S. manufacturing
- Strategically establish U.S. leadership in clean energy manufacturing

Reduce Market Barriers

- Strategic energy management
- Combined heat and power

Advanced Manufacturing Office: Economy-Wide Lifecycle Impacts

Primary Energy Consumption by Sector, 2010 (Quads)



Source: US EIA Annual Energy Review 2010, Table 2.1a. http://205.254.135.24/totalenergy/data/annual/pdf/sec2_3.pdf

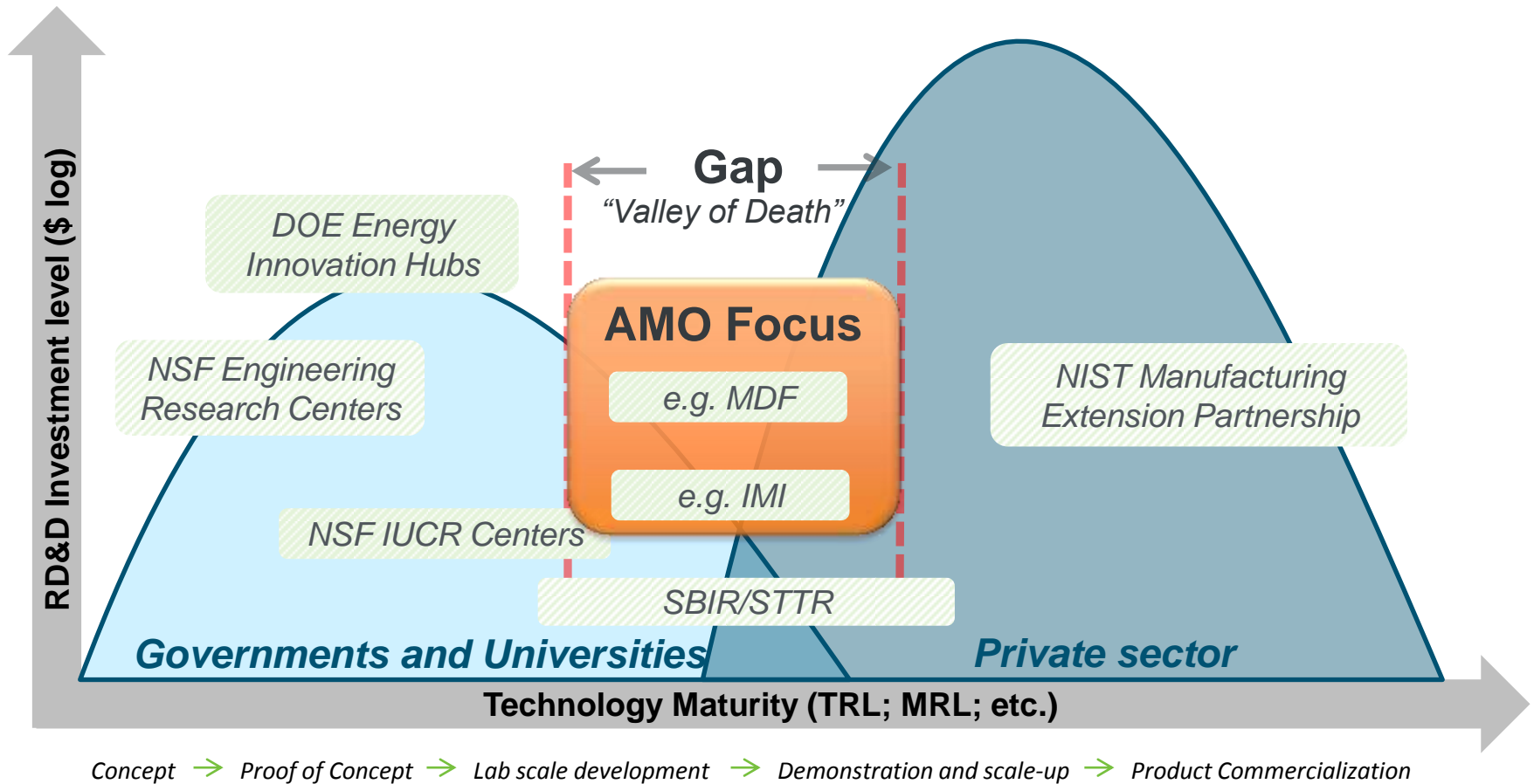
Advanced Manufacturing Office: Coordination across EERE



Advanced manufacturing challenges are common to multiple clean energy technology production systems.

Advanced Manufacturing Office: RD&D Focus on Bridging the Gap

AMO Investments leverage strong Federal support of basic research by partnering with the private sector to accelerate commercialization



Advanced Manufacturing Office: Innovative Manufacturing Initiative Projects

- **Goal:** Enable a doubling of energy productivity in U.S. industry
- **Plan:** Public-private partnership projects to accelerate commercialization of new product or process technologies at industrially relevant scales
- **Focus:** Cross-cutting, foundational technologies
 - **Example:** Working with PolyPlus Battery Company to increase lithium batteries' energy density by 2-10X at 50% cost with a goal of increasing from small applications to vehicles within 10 years
- **Funding:** 13 Initial selections in FY12 (~\$54 M DOE); 26 projects held for potential funding based on pending FY13 budget

Advanced Manufacturing Office: Manufacturing Demonstration Facilities (MDFs)

Barriers addressed:

- Access to expensive technologies and capabilities
- Sharing overhead costs - more efficient use of capital
- Increases visibility of unknown process options
- Accelerates partnership development and supplier relationships

Effect on U.S. competitiveness:

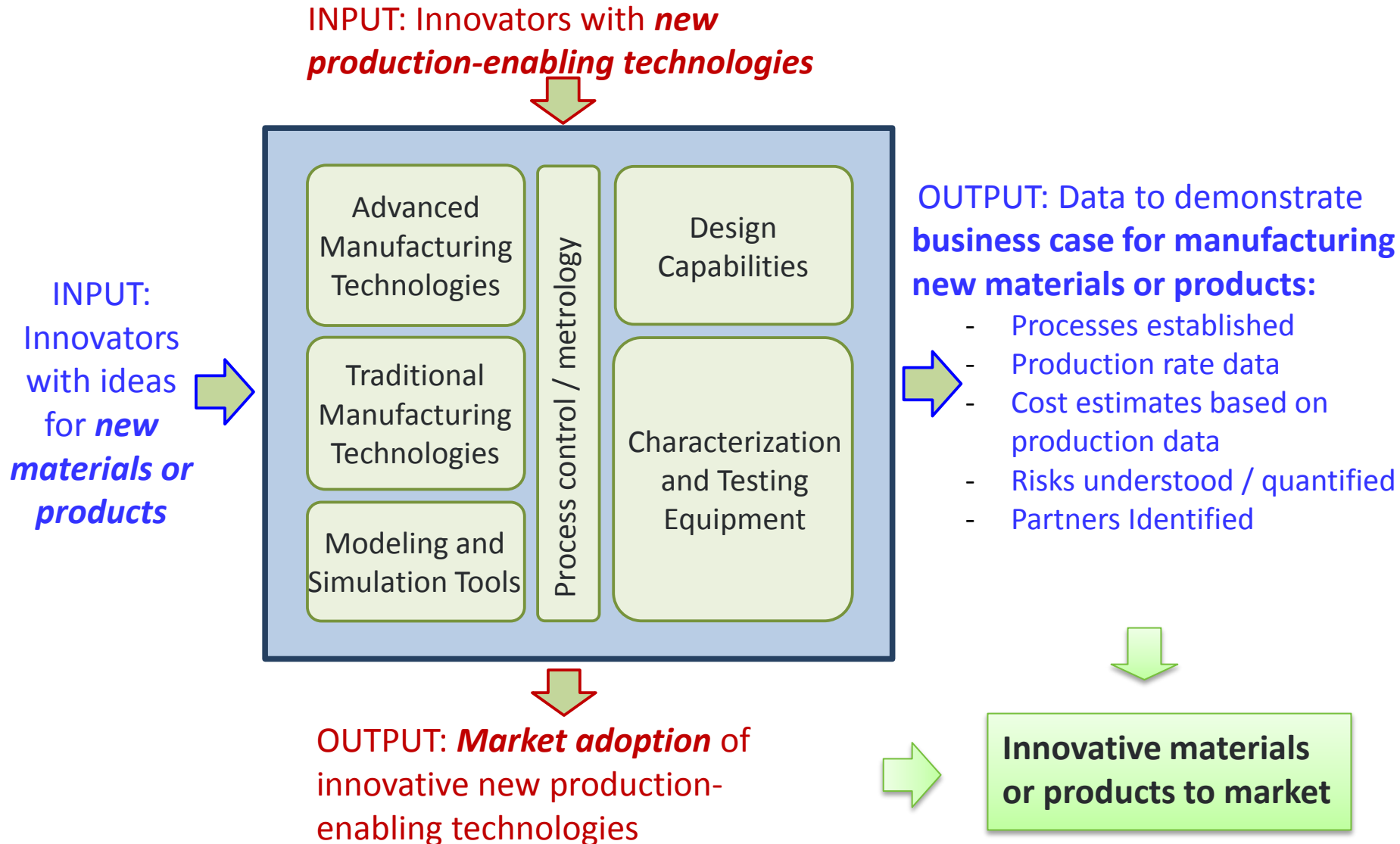
- Increased pool of domestic competitors, especially SMEs
- Increased rate of new product development
- Positive feedback between production & research/design accelerates both

MDF at Oak Ridge National Laboratory

- Additive Manufacturing
- Carbon Fiber



Advanced Manufacturing Office: Manufacturing Demonstration Facilities (MDFs)



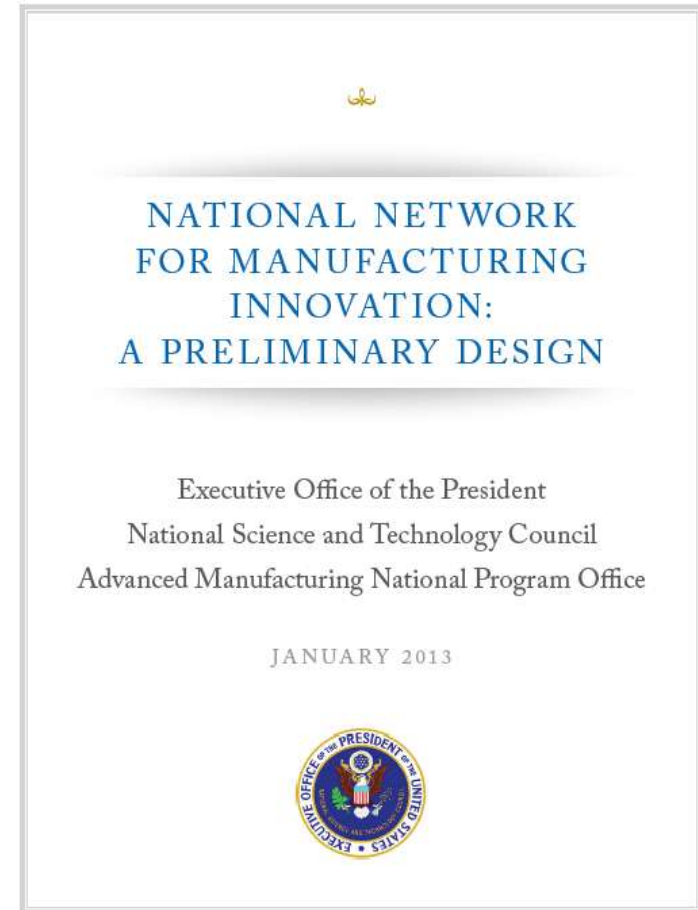
Institutes Update

National Network for Manufacturing Innovation (NNMI)

- Proposed by the President in March 2012 to accelerate cutting-edge manufacturing
- Partnership of industry, educational institutes, government and other participants
- 4 regional workshops and RFI shaped preliminary design report released in January 2013

Pilot institute – National Additive Manufacturing Innovation Institute (NAMII)

- Serves as a proof-of concept for the Institutes and NNMI
- Headquartered in Youngstown, OH



Critical Materials Energy Innovation Hub

Critical materials*: Elements that are key resources in manufacturing clean energy technologies

- dysprosium, neodymium, terbium, europium, yttrium
- Affect cost and performance of wind turbines, solar panels, electric vehicles, and energy-efficient lighting

Goal: Reduce the impact of supply chain disruptions and price fluctuations

- Integrate scientific research, engineering innovation, and manufacturing and process improvements
- Develop solutions including mineral processing, manufacture, substitution, efficient use, and end-of-life recycling

Funding: Investing up to \$120 million over five years (2013-2017)

- Consortium of 4 national laboratories, 7 universities and 8 companies
- Led by Ames National Laboratory



* As defined by U.S. Department of Energy. 2011. [Critical Materials Strategy](#). Washington, DC: DOE.

Technical Assistance Goals & Initiatives

Goals

- Reduce manufacturing energy intensity by 25% over ten years
 - Engage diverse set of industry in effective business models
 - Model key processes
 - Support 3rd party services
- Support the achievement of 40 GW of new, cost-effective combined heat and power by 2020.
(~ 50 % growth in installed CHP and offering ~ 1 quad of savings)

- Better Buildings Better Plants
- Superior Energy Performance
- Workforce Development
- SEE Action
 - IEE/CHP Working Group
- CHP & Clean Energy Application Centers
- DOE Regional Dialogues
- SEE Action
 - IEE/CHP Working Group



Goals

- Make commercial & industrial buildings 20% more efficient by 2020
- Save more than \$40 billion annually for US organizations
- Create American jobs

How

- Leadership
- Results
- Transparency
- Best Practice Models
- Recognition
- Catalyzing Action



Better Buildings Challenge: Current Partners and Allies

110+ public, private and non-profit organizations:

- 23 Commercial Partners
- 10 Better Buildings, Better Plants Partners
- 47 Public Sector Partners
- 17 Education Partners
- 13 Financial Allies
- 3 Utility Allies



Together, they represent:

- ~2 billion square feet of commercial and industrial space committed
- 300 manufacturing plants
- ~\$2 billion in private sector financing

Better Plants Program

- Voluntary pledge to reduce energy intensity by 25% over ten years
- 117 Program Partners, over 1,400 plants, ~6% of the total U.S. manufacturing energy footprint
- Partners implement cost-effective energy efficiency improvements that:
 - Save money
 - Create jobs
 - Promote energy security
 - Strengthen U.S. manufacturing competitiveness
- Through the Better Plants Program, companies receive national recognition and technical support from DOE



Newest Partners

- Lennox International
- Harley-Davidson Motor Co.
- International Paper
- Texas Instruments Inc.
- PaperWorks Industries, Inc.

Advanced Manufacturing Office: Superior Energy Performance (SEP)

- SEP is a market-based, ANSI/ANAB-accredited certification program that provides industrial facilities with a roadmap for achieving continual improvement in energy efficiency through improvements in energy management practices with the application of ISO 50001 energy management standard.
- 10 SEP certified plants have improved their energy performance between 6 and 25% over a three year period.

*Presentation of awards to
Volvo Trucks and Nissan
North America in
recognition of achieving SEP
certification
at Alliance to Save Energy's
Industrial Energy Efficiency
Forum in May 2012*



Advanced Manufacturing Office: Workforce Development

Industrial Assessment Centers: Creating the Next Generation of Energy Engineers

- Conduct hands-on assessments of small and medium-sized manufacturing firms
- Foster a specialized energy engineering curriculum
- Over 3,100 students trained - nearly 60 percent of IAC graduates go on to careers in the energy industry
- Over 15,600 assessments and provided nearly 117,600 recommendations for small and medium-sized manufacturing plants
- Assessments have identified nearly \$515M in energy savings and nearly 3.4 million metric tons in CO2 emissions reductions since 2006

Certified Practitioner in Energy Management System Program Developed

- 50 certified practitioners to date

Advanced Manufacturing Office: Combined Heat and Power (CHP)

- **Clean Energy Application Centers (CEACs)**

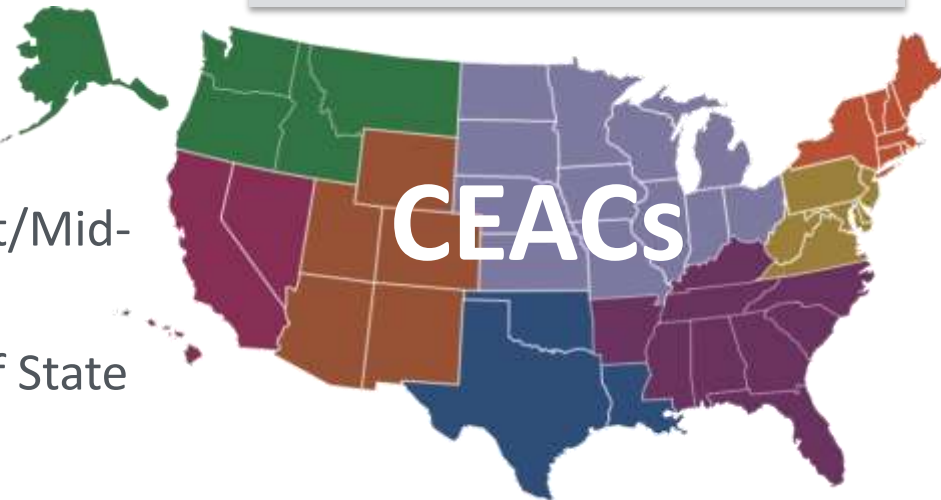
- Evaluating state policies and impact on CHP and share best practices
- Providing information on the benefits and applications of CHP
- Offer technical assistance to end-users considering CHP; Additional focus on the 550+ major source facilities for EPA Boiler MACT rule compliance

- **SEE Action Industrial Energy Efficiency and CHP Working Group**

- Regional dialogue meetings: Northeast/Mid-Atlantic region, March 13 in Baltimore
- Guide to Successful Implementation of State CHP Policies (expected Feb 2013)

Achieving the Executive Order goal of 40GW of new, cost-effective CHP by 2020 would yield:


- 1 quad savings
- 150 mmt CO2 savings
- 75% of McKinsey CHP economic potential
- \$10 billion/yr savings for energy users relative to typical use of energy





Manufacturing Supply Chain Analysis

Ongoing Analysis Includes:

- Analyzing the supply chains of EERE technologies to understand the competitive contexts for manufacturing a range of components and systems
- Advancing our knowledge about the future competitiveness of the U.S. as a location for manufacturing

 **1. Solar.** Combining valuable insights from solar (PV) technology cost roadmaps with our analysis of regional manufacturing trends, which are driven by both policy and market considerations

 **2. Wind.** Benchmarking the manufacturing costs for wind turbine blades, transportation costs, and analyzing correlations between project developments and factory locations

 **3. Batteries.** Analyzing global market dynamics and manufacturing cost and processes for vehicle batteries

The Clean Energy Race: In It to Win It

“The path towards sustainable energy sources will be long and sometimes difficult.

But America cannot resist this transition, we must lead it.

We cannot cede to other nations the technology that will power new jobs and new industries, we must claim its promise”

**- President Obama, Inaugural Address,
21 January 2013**



Clean Energy Manufacturing Initiative

- Emerging EERE-Wide Initiative
- U.S. Clean Energy Manufacturing Strategy
- Advanced Manufacturing Thrusts in All Programs
- National Network of “Manufacturing Demonstration Facilities”

