

The Role of Advanced Manufacturing in California's Economic Future

A Briefing Paper for the Informational Hearing

Senate Committee on Energy, Utilities & Communications
Senate Committee on Governance & Finance

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This summary paper prepares the members of the Senate Committee on Energy, Energy, Utilities, and Communications and the Senate Committee on Governance and Finance Committee for its March 21st hearing on the role of advanced manufacturing in California's future economy. This paper:

- Provides the various definitions of advanced manufacturing
- Summarizes federal action on advanced manufacturing
- Posing questions for Legislators to consider related to advanced manufacturing

What Is Advanced Manufacturing?

Advanced manufacturing applies new technologies and techniques to make the same products better, faster, and cheaper than before. It is difficult to differentiate between advanced manufacturing and manufacturing. President Obama's National Strategic Plan for Advanced Manufacturing, Iowa, Massachusetts, Texas, and the National Council for Advanced Manufacturing (NACFAM) offer varying definitions. Each of these is defined below.

1. National Strategic Plan for Advanced Manufacturing. In February 2012, President Obama's National Science and Technology Council released the National Strategic Plan for Advanced Manufacturing. The plan uses a portfolio of categories to define advanced manufacturing and targets federal investment in the following categories:
 - The adoption of "Advanced Materials" or newer nanoscale biological, smart, and composite materials.
 - The adoption of "Production Technology and Platforms" or processes that allow for the manufacturing of advanced technologies
 - The use of "Advanced Manufacturing Processes" which reduce energy use, increase resource efficiency, and reduce carbon emissions.
 - Create the "Data and Design Infrastructure" or the ability to integrate Advanced Materials, Production Technology & Platforms, and Advanced Manufacturing Processes.
2. Iowa. In 2005, Iowa developed a strategic plan to enhance advanced manufacturing in the State. According to The Iowa Department of Economic Development's "Briefing Paper for Iowa Advanced Manufacturing Industry Cluster," advanced manufacturing is:

"manufacturing industries that increasingly integrate innovative technologies in their production process and/or within the end product itself. The "art of technology adoption" and "the ability to use that technology to remain competitive and add value" tend to define the advanced manufacturing. Advanced manufacturers assess, investigate, and invest in technology areas across a wide spectrum of scientific,

engineering and information technology fields. These technological advances, once embedded in the manufacturing operation (either in the form of new processes or products) enable manufacturers to raise productivity, compete in global markets, and provide enhanced value to the customer through their products.”

Iowa’s Advanced Manufacturing Industry Cluster Strategy uses the North American Industry Classification System (NAICS) to identify 18 sectors for advanced manufacturing, including: aerospace, agricultural feedstock and chemicals, agricultural and construction machinery, appliances, automation and industrial machinery, building and construction products, clean technology, computers and related electronics, food processing and products, human biosciences, meat processing, motor homes and campers, packaging, polymers and miscellaneous plastic products, primary metals manufacturing, printing, research, engineering and industrial design services; and vehicular parts & components.

3. Massachusetts. In 2010, Massachusetts created an Advanced Manufacturing Initiative to “articulate the role the state and its partners in industry and academia can play to enhance manufacturing competitiveness in Massachusetts.” The initiative adopted the National Council for Advanced Manufacturing (NACFAM) definition below but further defined three categories of advanced manufacturing:
 - Companies that manufacture products for end-users, often in niche markets, selling both directly to consumers and business-to-business.
 - Companies that manufacture parts and components for technology sector Original Equipment Manufacturers (OEM) and system integrators in Massachusetts, the United States, and the world, by definition on a business-to-business basis.
 - Companies that manufacture traditional products for established markets in “novel ways.”
4. Texas. Similar to Iowa, Texas promotes advanced manufacturing clusters. Texas defines advanced manufacturing as “the integration and utilization of technologies in a system of production to improve processes and techniques to produce goods and services faster, cheaper and cleaner.”

Texas also includes a broad range of industries in their definition, including automotive, logistics and distribution, semiconductors, medical devices, software and process improvement, power generation, nanotechnology, food processing, computer hardware and components, robotics, microtechnology, polymers and advanced materials and new plastics.

5. National Council for Advanced Manufacturing. The National Council for Advanced Manufacturing, a non-partisan, non-lobbying think tank, defines advanced manufacturing as “an entity that makes extensive use of computer, high precision, and information technologies integrated with a high performance work force in a production system capable of furnishing a heterogeneous mix of products in small or large volumes with both the efficiency of mass production and the flexibility of custom manufacturing in order to respond rapidly to customer demands”.

What is the Advanced Manufacturing Partnership?

On June 24, 2011 President Obama launched the Advanced Manufacturing Partnership (AMP), a national coalition of industry, universities, and the federal government to invest in emerging technologies to create high quality manufacturing jobs and enhance the United States’ global competitiveness. AMP seeks to use existing programs and proposals to invest more than \$500 million in advanced manufacturing initiatives. Investments include: building domestic manufacturing capabilities in critical national security industries, reducing the time needed to make advanced materials used in manufacturing products, establishing U.S. leadership in next-generation robotics, increasing the energy efficiency of manufacturing processes, and developing new technologies that will dramatically reduce the time required to design, build, and test manufactured goods. Universities and companies will complement these federal efforts helping to invent, deploy and scale these cutting-edge technologies.

The AMP is led by Andrew Liveris, Chairman, President, and CEO of Dow Chemical, and Susan Hockfield, President of the Massachusetts Institute of Technology. Stanford University and the University of California at Berkeley are participating partners.

In February 2012, the Advanced Manufacturing Partnership (AMP) and the President’s Council on Science and Technology (PCAST) released *A National Strategic Plan for Advanced Manufacturing* which asserts “the fundamental importance of advanced manufacturing” to the nation’s competitiveness and security. The plan sets key objectives and priorities for federal policy in this space, specifically:

- Accelerating investment, especially by small- and medium-sized manufacturers
- Making the education and training system more responsive to the demand for skills
- Optimizing Federal advanced manufacturing R&D investments by taking a portfolio perspective
- Increasing total public and private investments in advanced manufacturing R&D
- Fostering national and regional partnerships among all stakeholders in advanced manufacturing.

What Else is the Federal Government Doing to Promote Advanced Manufacturing?

Other federal government initiatives include:

- The Departments of Defense, Homeland Security, Energy, Agriculture, Commerce are coordinating a government-wide effort to use their existing funds and future budgets (a goal of \$300 million) to invest in advanced manufacturing. These programs began in 2011.
- The National Science Foundation, National Aeronautics and Space Administration, National Institutes of Health and the Department of Agriculture are collaborating to invest \$70 million in research for next generation robots.
- The Department of Energy is using their existing funds and future budgets, up to \$120 million, to develop innovative manufacturing processes and materials to enable companies to cut the costs of manufacturing, while using less energy.
- Massachusetts Institute of Technology, Carnegie Mellon University, Georgia Institute of Technology, Stanford University, University of California-Berkeley, and University of Michigan committed to form a multi-university collaborative to share educational materials and best practices related to advanced manufacturing and its linkage to innovation.
- The United States Department of Commerce is developing an advanced manufacturing technology consortium with \$12 million in 2012, to identify public/private partnerships to breakdown common technological barriers to the development of new products.
- The United States Department of Labor awarded over \$183 million for technical skills training to help American workers fill jobs in advanced manufacturing.

What Legislators Should Ask About Advanced Manufacturing?

- What makes advanced manufacturing different from “regular manufacturing?” Is the distinction important for policymakers when considering California’s economic future?
- Does California currently have more or less advanced manufacturing facilities or jobs than “regular manufacturing?” Will advanced manufacturing grow as a share of the state’s economy in the future? Will advanced manufacturing jobs grow in the state?
- What are the advantages and disadvantages for advanced manufacturing in the United States instead of other countries?

- Does California have advantages over other states for attracting and retaining advanced manufacturing? What are they?
- Does California pose barriers or additional costs that would deter attracting and retaining advanced manufacturing? What are they?
- Do advanced manufacturing firms face barriers at the local level, such as zoning codes or environmental mitigations? Are these significant deterrents to investment?
- What policy changes could help maximize advantages and limit disadvantages? Which of these is most cost-effective? For example, are state efforts at enhancing the quality of the labor force more or less important than attempts to address potential cost disadvantages?
- What is the cost structure for firms that perform advanced manufacturing? Is this structure substantively different for facilities in California than other states? What are the important elements that policymakers should know about the cost structure of advanced manufacturing when considering policy changes?
- Is advanced manufacturing labor-intensive? How many people are needed to run advanced machinery? Will fewer be needed in the future as technology further evolves?