



Making Manufacturing a National Priority

NACFAM 18th Annual Policy Meeting

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“American manufacturers are a cornerstone of the American economy and embody the best in American values. They enhance U.S. competitiveness while improving lives domestically and internationally.”

Manufacturing in America: a Comprehensive Strategy to Address the Challenges to U.S. Manufacturers
January 16, 2004

NACFAM's mission, as an industry-led policy research organization, centers around brokering intense collaboration among its members and other key stakeholders to shape public policies and programs to make U.S. manufacturing globally competitive. NACFAM leads the research, prioritization, formulation, and dissemination of non-partisan, non-lobbying solutions to strengthen U.S. manufacturing. Members include small, medium and large manufacturing firms, manufacturing and educational associations, universities and community colleges, members of Congress and their staffs, federal agencies, and other non-profits.

NACFAM's policy initiatives seek to promote greater innovation and productivity within the nation's manufacturing sector, while recognizing federal government budget constraints. It focuses on four manufacturing policy and issue areas:

- Workforce Education & Training
- Supply Chain Value Creation
- Technology & Innovation
- Sustainable, Green Manufacturing

More information about NACFAM can be found at www.nacfam.org

MAKING MANUFACTURING A NATIONAL PRIORITY

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Making Manufacturing a National Priority

Summary of Key Next Steps for Action

Note: The meeting confirmed that NACFAM's mission is to broker intense collaboration to carry out the next steps below, doing so through conferences, workshops, consensus papers, etc., as required. To have any chance of success however, the entities underlined/bolded must be heavily involved and committed to the process.

Presidential Campaigns:

1. NACFAM will work with NAM and other associations to help **manufacturers**, **academia** and **government** to:
 - a. Develop the message with hard facts about jobs, voters, and the economy, including the importance of Network-Centric Manufacturing.
 - b. Convince candidates at all levels, especially the 2008 Presidential candidates, to challenge each other about what they will do to improve the global competitiveness of US manufacturing.
2. **All attendees** were urged to contact the Presidential campaign liaisons in their home states to offer their plant or facility as a backdrop for a campaign event focusing on manufacturing, including extensive media coverage.
3. NACFAM will promote to **its members** the NAM "Dream It! Do It!" campaign to encourage young people to pursue manufacturing careers, and their "Business Champions" program to encourage manufacturers to build stronger relationships with community and technical colleges to address their growing skills shortages.

Workforce:

4. The NACFAM **Workforce Advisory Council** will develop a White Paper for the message campaign to spell out the basic elements of a New Education System for America in the 21st Century, pinpointing the new system's importance for preparing students and workers for the more technical careers opening up in the U.S. manufacturing sector and emphasizing the importance of manufacturing to the U.S. economy and regional economic development and job creation/retention.
5. **DOL** and **DOEd** need to better define, coordinate and communicate career pathways in manufacturing, the ETA Advanced Manufacturing Competency Model, best practices, collaboration models, etc.
6. **DOL**, **DOEd**, **NSF**, **et al**, need to determine and publicize what has been done by the Federal government on training and education tax credits, simplifying the process to get career/tech ed grants, best practices and programs for STEM education and training, addressing STEM teacher skill gaps, etc.

Technology & Innovation:

7. **NACFAM** will help broker the creation and support of transitional research initiatives such as energy efficient manufacturing, interoperability, the model based enterprise, and wireless production networks.

8. NACFAM proposes as the first pilot effort a **Federally-sponsored** workshop of industry, government and academia brokered by NACFAM to give guidance to the NIST Manufacturing Engineering Laboratory (MEL) as it develops its strategic plan “to ensure that it remains relevant to manufacturers well into the 21st century” with a consensus paper as the output and model for other efforts.
9. **NACFAM** will work with its industry and academia members and the federal labs to find ways to better communicate needs, abilities, and collaborative opportunities among them all. This is beginning with collaboration with Purdue University using their web-connect manufacturing research hub.

Supply Chain Value Creation:

10. The NACFAM **Supply Chain Value Creation Council** will shape the policy and program initiatives recommended in this meeting, including funding and partnership ideas for appropriate federal assistance. The initiatives cover:
 - a. Definition of a robust national infrastructure for the fast coming Network-Centric Manufacturing environment.
 - b. Role and requirements of the MEP program in the required infrastructure.
 - c. Impact of existing DOD procurement regulations, policies and processes on SMMs and the Network-Centric enterprises they serve.
 - d. Need for a focal point with responsibility and funding for research in enabling supply chain/network technologies, standards, protocols, network structures, digital connectivity and social sciences.
 - e. Economic and industrial base impacts of off-shoring on SMMs as well as OEMs and the economy, including the effect of total cost methodologies.
11. The Council’s work will be the basis for the National Infrastructure Panel to be led by NACFAM’s CEO at the October 29 Doyle Center **NCM Forum** and his role in the December 5 panel at the **Defense Manufacturing Conference**, both of which will accelerate government understanding of the importance of NCM.

Sustainable Manufacturing:

12. Encourage the **MEP** effort to investigate, capture and share best global practices for sustainability with SMMs. Develop a plan to grow sustainability knowledge within MEPs as part of the necessary NCM infrastructure for competitiveness.
13. **NACFAM** will use NCM principles to broker the “radical, creative, intense collaboration” required to engage manufacturers with environmental, policy and academic communities to “unlock the true power of the sustainability revolution”.

DOL, NIST & IWGs on Manufacturing:

(Note: Many of the above steps were supported/suggested by the DOL/NIST speakers.)

14. **Industry** and **Academia** must define clearly what is needed from the Federal government, especially the two Interagency Working Groups (IWGs) on Manufacturing and the Federal Labs.
15. **Industry** and **Academia** requests for additional Federal funding must have crisp, clear, measurable data about benefits in terms of jobs, economic impact, etc.

Reports of the Meeting Sessions

Opening Plenary Session

Campaigns and a Call to Action

NACFAM CEO Eric Mittelstadt opened the 18th Annual NACFAM Washington Policy Conference by stating the three questions to explore to accomplish the Conference objective of *making manufacturing a national priority*:

1. How do we make manufacturing issues a national priority? What must we do as a community to shape the message to convince the 2008 Presidential candidates to speak out about their positions on the competitiveness of US manufacturing?
2. What are the next steps we can take when we return home to drive the necessary action to move the needle forward on these issues?
3. What do we need from the federal government, especially from the Interagency Working Groups (IWGs) on Manufacturing?

Mittelstadt then reminded the attendees that major speakers in the Conference were:

John Engler, President & CEO of the National Association of Manufacturers (NAM) and a former Governor of Michigan, the keynote speaker at the opening session.

David Kepler, Senior Vice President and Chief Sustainability Officer of the Dow Chemical Company, the speaker at the morning plenary session the second day.

Assistant Secretary of Labor Emily DeRocco and NIST Director William Jeffrey at the Advanced Manufacturing Leadership Forum (AMLF) luncheon on June 28, to cover the manufacturing related activities of both their Agencies and the Interagency Working Groups (IWGs) on Manufacturing.

NAM PRESIDENT SPEAKS AT OPENING SESSION – June 27, 2007

NAM President and three-term Michigan governor John Engler spoke on *how to make manufacturing a national priority ...* and what can be done by the manufacturing community to shape and promote this message.

Governor Engler stated that NAM and NACFAM have many shared goals: workforce development, STEM education, supply chain efficiencies, and support for MEP and more. He said however the most important goal we share is simply telling manufacturing's story, helping the public understand how much manufacturing contributes to the U.S. economy and the American way of life, for example:

- Manufacturing produced \$1.6 trillion in wealth in 2006.
- Manufacturing employs 14 million Americans directly, and another six million in related areas such as supply chain and financial services.

- If U.S. manufacturing were a country by itself, it would be the 8th largest economy in the world.

Given the media and political climate, he said our job is to raise manufacturing's profile, to elevate it to a defining issue in the 2008 campaign – especially the presidential race.

To help promote the manufacturing message, Engler urged the attendees to contact the campaign liaisons in their home states and offer their plants or facilities as backdrops for campaign events. He encouraged attendees to use their face time with the candidates to ask them about important issues to manufacturers – energy, the skills gap, the high cost of health care, the need to expand overseas markets to U.S. manufactured goods, etc.

The Governor concluded by asking attendees to help promote NAM's "*Dream It! Do It!*" campaign to encourage young people to pursue manufacturing careers ... and through the NAM "*Business Champions*" program to build stronger relationships with community and technical colleges to address the growing skills gap challenges in manufacturing.

ADDITIONAL DISCUSSION

As Thomas Friedman alludes to in *The World is Flat*, products that can be defined and packaged will tend to be done offshore because of significant labor cost advantage and portability due to IT technology. Thus, as products move down the commodity curve they will continue to have labor cost pressures to go overseas. This is a tough issue because US labor costs are not the lowest globally and hopefully never will be as we continually strive to improve our standard of living.

On the other hand, the US advantage has been and must continue to be technical innovation and the know-how to rapidly convert technology into manufactured products. Thus, innovation along with rapid deployment of it thru transitional research is the economic engine for our future.

This cornerstone statement is the basis for all four of the focus areas of this Meeting. For example, it is why it is essential for education to develop its students' skills to both innovate and produce... for the most part it doesn't today except perhaps in the IT field. In the area of technology, because we are a smaller country than many of our competitor nations, we need "intense collaboration" to accelerate the transitional research required to increase our ability to rapidly deploy the results of our innovations. This "intense collaboration" is a requisite for success in supply chains and sustainability as well.

NACFAM's mission centers on brokering that kind of "intense collaboration". Most of us grew up in the era of "intense *competition*". The hyper-competitive global economy of the 21st century however requires a new business model for our US economy to thrive. This is vitally important for going forward.

Further, the agenda needs to have a space-age like focus on creating new innovative technology and commercially producing it very quickly. The only competitive advantage we can enjoy is creation (Yankee Ingenuity) and manufacturing know-how. This is vital to both national security and the economy, and would seem to be a great segue from war to growth for presidential candidates.

Workforce Education & Training Breakout Session:

What can the manufacturing community do to enhance Science, Technology, Engineering and Math (STEM) education as a national priority?

On June 27-28, 2007, NACFAM convened manufacturers, educators, government, and association leaders to begin work to position STEM education initiatives and related programs as a major national priority to be addressed by the 2008 Presidential candidates. NACFAM's Workforce Education and Training Advisory Council began the process of identifying major issues and key policy recommendations for NACFAM and the membership to carry out as next steps in this area.

A major issue that the United States will face is a “**demographic tidal wave**” in which thousands leaving the workforce, particularly manufacturing jobs, will send a crash of endemic proportions to firms in need of high-skill talent. Recognizing this, **a multi-prong approach** to reach individuals (students, incumbent workers, dislocated workers, retiring workers, minority groups and others) to fill high-wage, high-skill jobs, is necessary to head-off the impending workforce shortage crisis.

One of the key policy recommendations that evolved from the two-day discussion was taking current legislation, such as “No Child Left Behind,” to a new level where the focus is on “Career and Technical Education” across the entire education system, leading to the ability to obtain high-skill, high-wage jobs. Just as all students need to reach an academic standard, so too must they obtain skills that will position them for making career choices. Thus, it's not just about reading and writing at a certain level, but the why and how it's applied. In doing so, individuals will see the application of the skills and knowledge they gain from their education, and know that given choices they can “jump on or jump off” the career ladder as their circumstances in life change.

Other issues discussed at the June 2007 conference were:

- Spotlight the value and importance of manufacturing to the economy in the context of STEM and jobs in general
- Everyone needs career-focused skills: establish a multi-prong approach to reach students, incumbents, dislocated, minority groups, and underemployed workers to help guide them for promising careers
- Career Pathways/Lattices are important to show continuum of education and training in every sector
- Qualified STEM teachers and the infrastructure to support them are as necessary as placing the individuals in STEM programs

The following recommendation was suggested:

Start “national positioning” of the value and importance of manufacturing by creating a sense of urgency at the grassroots level to affect change at the national level. Congressional members will take notice if this subject affects their district/state votes – have the message

resonate with their voters and have the voters communicate the importance of manufacturing to their members.

- Technology & Innovation/STEM
- Workforce Preparedness – this is something everyone can relate to regardless of their career choice

Next steps included:

- NACFAM should draft and distribute a White Paper to help set the stage for the grassroots and national messaging campaign to raise the level of importance and impact of manufacturing on jobs and the economy. This paper should include a legislative analysis of House/Senate bills and their potential impact on appropriations/programs, as well as the economic statistics of manufacturing and its multiplier effect on the economy
- NACFAM should communicate to and include diverse organizations in the Workforce Council to represent all sectors of manufacturing
- Define the best education and training approaches to reach all populations:
 - Clearly define career pathways ... and promote them
 - Define best practice models and training programs
 - Promote and use models such as the Employment and Training Administration's Advanced Manufacturing Competency framework
 - Identify what others are doing in this area to collaborate and avoid duplication of effort
- Identify education and training tax credits for industry, students and incumbent workers
- Promote broader funding for career/tech ed community – simplify the process to get grant money
- Conduct a study to identify the gap between expectations of what STEM teachers should know to the actual needs of STEM teachers. Use this gap analysis to recommend in-service training and changes to pre-service teacher education curriculum
- Develop database of best practices and programs in STEM education and training

The NACFAM Workforce Advisory Council will work together to shape the policy and program initiatives recommended in the steps above. For more information, visit www.nacfam.org.

Technology and Innovation Breakout Session:

Open Innovation and Strengthening the Innovation Infrastructure

On June 27-28, 2007, NACFAM convened manufacturers, researchers, government, and association leaders to begin work in developing innovation initiatives and related programs required for strengthening the overall U.S. innovation infrastructure. NACFAM's Technology and Innovation Advisory Council began the process of identifying major issues and key policy recommendations for NACFAM and the membership to carry out as next steps in this area.

We concluded that one of the foremost issues facing the United States manufacturing sector relates to the under- investment¹, both in the private and public sectors, in the **transitional phase² of manufacturing research** – the feasibility, reproducibility and scalability of new technologies.

Examples of the best practices in collaborative research models that could be emulated for today's most important and under-addressed transitionally related manufacturing research include:

- United States Council for Automotive Research (USCAR)
 - Similar to FreedomCar, there needs to be a ManCar focused on the transitional phase of manufacturing research
- United States Advanced Battery Consortium (USABC)
- Semiconductor Research Corporation (SRC)
- Semiconductor Manufacturing Technology (SEMATECH)
 - Focused mission, based on technology pull, incorporates an exit strategy
- University Technology Centers (UTCs)
 - Good Example: Rolls-Royce / Univ. of Sheffield / U.K. Government
- DARPA-style initiative for manufacturing technologies
- NIST Advanced Technology Program (ATP) / Technology Innovation Program (TIP)
- National Transitional Research Strategy for Manufacturing
 - Good Example: Japan Ministry of Economy, Trade and Industry (METI)

Other issues discussed at the 2007 conference included:

- There is too much cost, risk and knowledge required for independent transitional research by any one company. We need to develop common consensus on a list of high impact projects with understandable needs and benefits, clear and measurable project objectives, each participant with skin in the game and pressure to deliver.
- Open collaboration in manufacturing research can be fostered through web-connected networks as seen in the cancer research or nanotechnology fields www.nanohub.org.
- Need for better communication, coordination and partnering between industry, university research, and federal lab initiatives.

¹ It has been estimated that only 3% of the total automotive R&D has focused on early-stage technical development (ESTD). See Auerswald, Philip E., Lewis M. Branscomb, Nicholas Demos, and Brian K. Min, [Understanding Private-Sector Decision Making for Early-Stage Technology Development, A "Between Invention and Innovation Project" Report](#), NIST GCR 02-841A, September 2005.

² The terminology of "transitional phase of manufacturing research" has often been referred more commonly as "applied manufacturing research" – focused on the ability to rapidly move from technical feasibility to commercial viability. For further description of "transitional research" see Appendix I.

Summary of “Straw Poll” Survey Results:

- NACFAM should take the lead in the prioritization, justification, dissemination and transitional research related to manufacturing technology and innovation.
- NACFAM must help broker the support and creation of these top transitional research initiatives.

What recommendations do you have on how to better connect NIST and other labs with industry needs?

- 45.0% (18) – **More Collaboration**
 - Set priorities jointly with industry
 - Simpler and more standardized engagement procedures
 - More activities that engage with industry
 - Increasing need for specific mfg tech focused consortiums
- 22.5% (9) – **More Transparency / Access / Communication**
 - Centralized inventory of federal projects and personnel expertise
 - Develop a collaborative network of virtual mfg tech centers
 - Communicate future joint-direction through conferences and summits
- 12.5% (5) – **Policy Related Issues**
 - Ease restrictions on collaboration
 - IP-Patent-Licensing rules to enhance not hinder collaborative research
 - Improved federal inter-agency activity coordination

What potential transitional research areas should be considered & what would the goals be?

- 15.0% (6) – Energy Efficient Manufacturing (including measures and standards)
- 12.5% (5) – Interoperability
- 7.5% (3) – Automotive Battery Technologies
- 7.5% (3) – Model Based Enterprise
- 7.5% (3) – Wireless Production Networks
- 5.0% (2) – Composite Mfg Technologies
- 5.0% (2) – Joining, Forming and Non-Destructive Testing Technologies
- Other notables – Adhesive Bonding, Liquid Skin, Smart Assembly

From these discussions, the next steps included:

1. Create NACFAM consensus paper (top ten manufacturing technologies – perhaps with a delphi style survey) to call for collaborative transitional research as a national priority, particularly for the 2008 Presidential candidates.
2. Develop high priority collaborative manufacturing technology project proposals requiring transitional research.
3. Better communicate needs, abilities, and collaborative opportunities between industry and federal labs.
4. Promote and assist open innovation using a web-connect manufacturing research hub.

Supply Chain Value Creation Breakout Session:

Strengthening the Manufacturing Infrastructure

On June 27-28, 2007, NACFAM convened manufacturers, researchers, government, and association leaders to begin work in developing innovative initiatives and related programs required for strengthening the overall U.S. manufacturing infrastructure. NACFAM's Supply Chain Value Creation Council began the process of identifying major issues and key policy recommendations for NACFAM and the membership to carry out as next steps in this area.

We concluded that one of the foremost issues facing the United States manufacturing sector relates to the general business shift from solely focusing on "integration" issues to more specifically searching for "value creation" throughout the extended enterprise. Unlike earlier supply chain integration initiatives, this mind-shift places much stronger emphasis on support activities which increase trust, collaboration and connectivity for creating more network-centric manufacturing capabilities.

The continuous pursuit to increase speed, quality and efficiency while minimizing waste and risk throughout the extended enterprise has placed greater emphases on effective management of network-centric enterprises. For firms, network-centric manufacturing is emerging as a business and product differentiator in the world marketplace. For manufacturing support entities (such as universities, government and non-profits), assistance to manufacturing must similarly evolve to provide relevant support for the overall U.S. network-centric manufacturing infrastructure. In our increasingly interdependent world, promising initiatives such as product life-cycle management, sustainable manufacturing, and next generation advanced manufacturing technologies and processes will all benefit from a highly effective network-centric manufacturing infrastructure.

Discussion Points of Network-Centric Manufacturing Included:

- Original Equipment Manufacturers (OEMs) are becoming more focused on their integration activities and are becoming more dependent on their suppliers, who are often small to medium manufacturers (SMMs).
- SMMs face both significant challenges and opportunities for responding to multiple (sometimes conflicting) demands for increased ability, flexibility, connectivity, and risk-sharing while remaining significantly cost and time constrained. A network-centric manufacturing (NCM) support structure is required for SMMs to remain globally competitive.
- NCM is different from supply chain integration (SCI). Simply stated, SCI represents those activities that one company, the OEM, employs to connect to its supply chain. NCM represents those activities employed by the OEM and its suppliers collaboratively to assure their collective success in advancing value creation throughout their network, providing a more robust capability for visibility and speed.
- This importance was highlighted by one OEM participant who estimated that 25%-50% of the OEMs value comes from below Tier 1 suppliers. Thus, the OEMs need increased ability to manage and collaborate throughout the supply chain. NCM

provides a more robust capability for visibility and speed below Tier 1 for both SMMs and OEMs.

- One probable outcome from the lack of SMM capacity will be for OEMs to increase the search for global best practices for their sourcing solutions. Off-shoring tends to be the most noticeable result. This business reality lends weight to supporting the case for an effective network-centric manufacturing infrastructure in the United States to reduce the need for such off-shoring and the attendant US job losses.
- Connective technologies such as creating a “digital thread” through the total product life-cycle will enable more integration of supply chain activities and will become increasingly important for an effective NCM environment.

Recommendations for strengthening NCM in the U.S. included:

1. Communication with and education of government leaders on the importance of the manufacturing supply chain/network to the economy.
2. Establish new capabilities and mandates for MEPs to fill capability gaps in the manufacturing supply chain that are essential to ensure the future competitiveness of SMMs in this network-centric manufacturing (NCM) environment.
3. Establish the overall infrastructure needed to support SMMs in the evolving NCM environment that is shaping supply chains/networks. This requires new investment and new mandates to bridge the gap between SMMs and OEMs. Industry including OEMs must play a significant role in guiding the development of this infrastructure.
4. Remove policy and regulatory constraints that reduce the ability of SMMs to compete for federal government business.

Discussion of current federal agencies, policies and practices impact on NCM:

- What is the network of agencies and how does it act? Who are the stakeholders? How to engage? How can funding sources among agencies and constituencies (especially within DOD) be harmonized for better leverage? What is the role of Interagency Working Groups (IWGs)?
- Long term contracts need to be reflected at all levels in the supply chain while also permitting for quick contracting to provide flexibility from an operational view (e.g., out-of-production parts).
- Within DOD there is no central function, including the ManTech program, that is funding research that would look at supply chain/network specific improvements.
- If agencies could provide SMMs support as a variable cost (consumption based) versus fixed cost and if the support was provided in a distributed manner, it would be very helpful for SMM participation.

Discussion of possible NIST-MEP role in NCM:

- While MEP may be the most logical starting point for building an infrastructure to support, few people in the MEP system understand the increasing importance of NCM capabilities, how SMMs need to respond to these new demands, and how MEP can play a critical role in the success of SMMs within the evolving NCM demands.
- Increased trust and collaboration must be developed between OEMs and suppliers. MEP can play a critical role as a 3rd party in supporting this focus. A case study is required that supports real cost savings in order to be credible in supporting the need of a 3rd party approach. Suppliers often do not trust OEMs because of their emphasis on cost reduction. On the other hand, many defense OEMs do not understand how to access MEPs to identify / broker partnering relationships, and some view MEPs as a threat.
- MEPs do not have a business model that can be used to request funding for MEPs to serve as the national infrastructure. NCM requires a consistent approach across all MEPs which will require some cultural change and a good business case to sell 3rd party service such as quality surveillance to OEMs.
- MEPs have certain competencies (e.g., lean) that are useful, but there is potential to expand the competencies (e.g., connectivity) to improve support to SMMs. MEPs must create a case that shows benefits to SMMs in the first year or two and then over longer term periods (e.g., 3, 5, 10, 15 years). MEPs must find a few successful examples that demonstrate coordination of quality work through 3rd parties.
- To access NCM more effectively, standard processes across industrial sectors must be developed. If resources were significantly increased for MEPs (of which a significant part went to a national program), it would make the overall program more effective. A pilot program would need to be developed to assure positive results for the additional funding.

Further Recommendations for strengthening NCM in the U.S. included:

5. Establish a focal point with responsibility and funding for research in enabling supply chain/network technologies, standards, protocols, network structures, digital connectivity and social sciences to ensure future SMM competitiveness.
6. Form an industry advocate group to develop a proposal to position MEPs as the national supply chain infrastructure capable of assisting SMMs in using digital technologies and connectivity to close supply chain capability gaps and enhance competitiveness.

6.1 Define a phased plan that adds funding in areas of demonstrated MEP competency. Near term, significant funding should be added to deploy demonstrated competencies. Mid-term, capabilities should be added as additional supply chain competencies are demonstrated. Long-term, MEPs should be linked to become a major part of the national NCM infrastructure.

7. Conduct a study of existing DOD procurement policies and processes (e.g., total cost formula) to understand their impact on the ability of SMMs to pursue bid opportunities to expand the industrial base.
 - ✓ Identify potential policy and process changes that would improve SMM bid opportunities.
 - ✓ Account for lead time in spares and repairs sourcing decisions.
 - ✓ Conduct a pilot to verify the effectiveness of these changes.
8. Conduct a study to understand the economic and industrial base impacts of off-shoring on SMMs. Include in the study the influence that the adoption of total cost methodologies could have in achieving balanced procurement decisions.
9. Encourage MEPs to investigate, capture and share best global practices for sustainability with SMMs. Develop a plan to grow sustainability knowledge within MEPs as part of the necessary NCM infrastructure for future competitiveness.

NACFAM Next Steps:

- A. The NACFAM Supply Chain Value Creation Council will work together to shape the policy and program initiatives recommended in the steps above. This includes funding and partnership ideas for appropriate federal assistance with open innovation requirements. (For more information, visit www.nacfam.org.)
- B. The results of the Council's work will become the basis for much of the National Infrastructure Panel discussion to be led by NACFAM's CEO at the October 29 Doyle Center NCM Forum.
- C. NACFAM will collaborate with other manufacturing associations, especially the National Association of Manufacturers (NAM) to work toward more fruitful presidential campaign discussion of manufacturing, including raising NCM as a national priority.

Sustainable Manufacturing Plenary Session:

Meeting the Risks of Sustainability Leads to Rewards

Dow Chemical Company Senior Vice President David Kepler spoke at the Thursday morning plenary session on June 28 on *Sustainability at Dow: Managing the Risks, Reaping the Rewards*.

In commenting on the challenges confronting Dow Chemical in building sustainability into its operations, Kepler focused on the positive impact of collaboration and connectivity within and among the company's supply chains:

- It may surprise you to know that the breakthroughs and changes we are about to experience in the area of sustainability are every bit as revolutionary as we experienced with the Internet and other technologies of the 1990s.
- You are already seeing some of this in the feeding frenzy going on now among established and start-up companies wanting to position themselves as the *next big thing* in green technology, green marketing and so on.
- Ask yourself "what was the key insight that made possible the Internet revolution?" I believe the answer is *collaboration* ... among large groups of people who were not necessarily connected by geography or affiliation to a company or socioeconomic status.
- Today, *radical collaboration* is finding its expression in many ways ... from the phenomenon of YouTube to the Human Genome Project and the strategies that have been used to solve these massive challenges.
- Unlocking the true power of the sustainability revolution is fundamentally about *collaboration* in revolutionary and exciting ways.
- One of the things I have learned is the importance of people working together – sharing ideas ...collaborating ... networking. Not just people who share the same point of view, but among people with very different points of view.
- Sandia thinks about security. Dow thinks about chemistry. Each never thought to work together...It's not a funding problem, it's a relationship problem.
- In both IT and the world of sustainability or any field where technological innovation is driving (or failing to drive) human progress, there are moments of inflection in the history of those fields where technology connects with opportunity to drive *step-change* in human progress.
- When *step-change* moments happen through technology breakthroughs, they change the rules for everyone.
- Chemistry today stands at a similar threshold – the threshold of a *step-change* moment in the way our industry will revolutionize future economic, environmental and social sustainability. We are on the cusp of a revolution.
- Before exploring that revolution, we must acknowledge that every *step-change* in technology, whether it is IT, chemistry or anything else, carries with it unforeseen and unintended consequences – some good and some not so good.
- Technology innovation accelerates human progress up to the point where the *law of unintended consequences* kicks in to slow the pace at which any individual technology is capable of driving more progress.

- The best way to forestall the *law of unintended consequences* is through *deep collaboration* with the stakeholders who care most about what those consequences might be.
- That means not simply the people inside our company, but well beyond our fences ... in our communities ... and among the environmental, policy and academic communities that contribute to the ultimate success of our technologies.
- As a manufacturer of raw materials used to make literally millions of products that people use everyday, Dow has a unique opportunity to influence the manufacturing practices of a variety of different markets.
- At Dow we have learned that managing the risks associated with being a ubiquitous industry comes down to one simple truth – we must face reality whether it is related to providing 1.2 billion people with safe water ... controlling the world's appetite for energy ... or addressing new and unorthodox threats to our safety and security.
- We have organized our sustainability commitments to help provide solutions to these realities ... and we are making progress.
- The organization of our approach to sustainability and the progress we have made are about *creative collaboration* more than anything else.
- Early in our work on sustainability, we created an external advisory panel of experts in the fields of corporate environmental, social and financial responsibility – what we now know as sustainability.
- The panel's role is to help us take an objective view of reality, identify our blind spots, and encourage us to listen. We have learned to set aside our immediate solutions and look for the *next best answer* by listening to others' deeper, broader concerns.
- Dow's view of sustainability on issues such as *safety and security in transportation*, *energy efficiency* and *climate change* extends beyond our fences and into the very infrastructure on which we depend to move our products.
- Risk management is part of strategy. Risk is also about opportunities.
- The critical element in accomplishing our sustainability goals is **The Human Element** and the breakthroughs that can occur when people work together ... across artificial boundaries ... and are finally able to produce *step-change* through more *intense collaboration*.
- Caution: Without accountability, collaboration can become a debate society.

Discussion by Participants Included:

- Product Life Management (PLM) is a key part of sustainability, including materials in the product as well as other materials and products used in manufacturing.
- Avoiding environmental problems requires the visibility into the supply chain provided by the *intense collaboration* and connectivity of the Network-Centric Manufacturing model.

AMLF Roundtable Luncheon:

NIST Director Dr. William Jeffrey and Assistant Secretary of Labor Emily DeRocco on their Agency & IWG efforts to strengthen US manufacturing

Dr. Jeffrey pointed to three specific examples of how NIST is gearing up to help U.S. manufacturers – *strengthened research opportunities* that directly impact the manufacturing community ... *increased relevance* of the Manufacturing Engineering Laboratory (MEL) and the Manufacturing Extension Partnership (MEP) to the manufacturing community in this hyper-competitive global market ... and *a greater NIST leadership role* in coordinating efforts across the Federal government to support manufacturing. A summation of his remarks follows.

Helping the U.S. to drive and take advantage of the increased pace of technological change is the top priority at NIST. Advances in nanotechnology, biosciences, and information technologies, will fundamentally change the products and services available, the way they are manufactured, and the impact on our quality of life.

The NIST Laboratories provide the measurement “tool box” required by manufacturers to be first to market – with the highest quality product -- and to be the most innovative. To make products well, production must be controlled so it is reliable, predictable, and cost-effective. The key to that is the ability to measure the various attributes of both products and processes.

The NIST MEL is focused on the needs of U.S. manufacturers. MEL is now developing a clean-sheet of paper, strategic plan to ensure that it remains relevant to manufacturers well into the 21st century and is looking for industry input. Critical manufacturing technology needs being considered include 1) pushing the frontiers of dimensional metrology to sub-nanometer resolution, 2) improving in-process, real-time measurement technology on the factory floor to assure quality, and 3) ensuring the security and reliability of industrial control systems to maintain the integrity of manufacturing enterprises. Dr. Jeffrey emphasized that changes in funding allocations require crisp, clear and measurable project benefits.

MEP is transitioning to its Next Generation focus on 1) methodologies that guide continual innovation of products, processes, services and to reduce bottom line costs and increase top line growth, 2) a system to assess manufacturers’ needs and identify potential technology solutions and 3) decision support tools and market intelligence to drive change.

NIST has assumed a leadership role in coordinating the efforts of the many Federal departments and agencies that support manufacturers several of these efforts. For example, NIST MEP is developing partnerships with several agencies such as DOL, EPA, DOD, USDA and other parts of DOC focused on leveraging collective resources to help commercialize innovative technologies and processes.

The Interagency Working Group (IWG) on Manufacturing R&D, chaired by NIST and consisting of members from 15 Federal agencies, develops recommendations on manufacturing R&D policy, programs, and prioritization. It is currently coordinating three areas – Manufacturing for the Hydrogen Economy, Nanomanufacturing, and Intelligent and Integrated Manufacturing.

Traditionally federal support is essential for physical infrastructure (power, water, roads) plus basic R&D. Focus now must be on the appropriate Federal innovation infrastructure (early

capital investments, IP rights, technology transfer, workforce, new business creation). (Participants added Network-Centric Manufacturing.)

Dr. Jeffrey closed by saying that NIST and NACFAM have partnered for years in supporting the nation's manufacturers, and NIST looks to an even stronger partnership with NACFAM to ensure a robust manufacturing community.

Assistant Secretary Emily DeRocco noted that five manufacturing workforce recommendations were contained in the *Manufacturing in America* strategic plan of the Department of Commerce released in January 2004. These called for 1) enhancing the workforce skills essential for employment in manufacturing enterprises of the future; 2) establishing a high school and technical education partnership initiative; 3) establishing Career Advancement Accounts; 4) coordinating economic adjustment for manufacturing communities; and 5) improving delivery of assistance for and retraining of displaced workers.

To help coordinate the Federal response to these recommendations, Assistant Secretary DeRocco was asked to chair the Task Force on Workforce Education and Development, a subcommittee of the Interagency Working Group (IWG) on Manufacturing Competitiveness. One its major tasks was to develop a framework for the *competencies* required in advanced manufacturing so prospective workers would know what skills they needed to master for a successful career in manufacturing. The *competencies framework* provides a common language and reference tool that facilitates communication among industry leaders, educators, and other stakeholders as they implement a variety of workforce development activities. The Employment and Training Administration (ETA) has developed an online *Competency Model Clearinghouse* to showcase the competencies framework as well as a variety of interactive tools, including a searchable database of other competency-related resources.

ETA and the IWG also recognized that entire regions dependent on existing manufacturers were being impacted by the transformation of the manufacturing sector. To help affected regions both support their manufacturing base and diversify their economies, ETA and the IWG developed a *Community Blueprint* identifying the variety of public resources that the communities could utilize. This *blueprint* became the foundation of ETA's WIRED Initiative which is about integrating, aligning and leveraging economic development, workforce development, and education resources to support a workable regional economic vision.

ETA also partnered with the Manufacturing Extension Partnership (MEP) in eight regions to develop pilot programs focused on technology transfer and transition. The MEPs are working with larger manufacturers to identify technologies that are either not in use or available for license ... and therefore transferable to smaller, entrepreneurial companies that can bring their potential to market. Thus the WIRED model applies to technology and innovation in manufacturing, and studies are under way to apply it also to sustainability and green collar jobs. This also shows that IWG actions are the result of defining clearly what is required of its member agencies.

One of the key challenges in manufacturing is the need to attract young people to jobs and careers in these industries ... and to develop educational pathways that will help students gain the foundational and specialized skills required to find employment in these increasingly technical advanced manufacturing sectors. In fact, University of Kentucky research showed that job training has more impact on job creation than R&D tax cuts.

APPENDIX I – Transitional Phase of Manufacturing Research

We agreed during the June 27-28 conference that the private and public sectors are increasingly under-investing in the transitional phase of manufacturing research – the feasibility, reproducibility and scalability of new technologies. To overcome this “Valley of Death” for new manufacturing technologies, transitional manufacturing research requires increased collaboration, risk sharing, and co-investment. Strengthening the transfer of pre-competitive research into usable manufacturing applications depends on increased success during this phase. Effective collaboration of transitional research was identified as a critical activity for manufacturing to remain competitive within the United States.

The table³ below summarizes the significant characteristics of innovation and market competition as they evolve over the three phases.

	<i>Fluid, Emerging Phase</i>	<i>Transitional, Growth Phase</i>	<i>Maturity Phase</i>
Type of innovation	Radically new products, with frequent major changes; high technical uncertainty but broad R&D focus	Gradual increase in process innovation; at least one stable, high-volume product design emerges	Mostly process innovation, aimed at cost reduction; incremental product innovations
Product life cycle	Short R&D-to-market cycle; diverse, highly customized products and services; frequent product changes; inefficient production processes	Longer development periods and product life; increase in standards and output level; R&D focuses on specific product features	Long R&D-to-market cycle; process change is costly and slow; standard, or commodity-like products
Resource requirements and barriers to entry	Relatively low barriers; small-scale plants located near R&D and general-purpose equipment; high scientist/engineer count	Medium barriers; some automation and specialized equipment; increasing facilities investment required	High barriers; special-purpose equipment, mostly automated processes; less labor content
Number of competitors	Initially few competitors, but rapid entry in response to market opportunities; frequent changes in market share	Declining number of competitors after emergence of dominant design	Few dominant firms; stable market shares
Type of competition	Technical performance	Production differentiation	Price/cost
Organizational control	Informal and entrepreneurial	Growth of hierarchical features (product and task subgroups)	Division structure; rules and goals; enterprise diversification
Financing	"Family/friends," angel, seed capital; research grants	Venture capital	Retained earnings, equity debt

³ Table taken from Powell, Jeanne and Francisco Moris, [Different Timelines for Different Technologies: Evidence from the Advanced Technology Program](#), NISTIR 6917, Gaithersburg, MD, November 2002.

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