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Transportation**

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Good morning, I'm Deborah Wince-Smith, the President of the Council on Competitiveness. Thank you, Chairman Stevens, Senator Inouye, Senator Ensign and the members of the committee, for this opportunity to present testimony on the National Innovation Act and related proposals for assuring America's leadership and competitiveness in the 21st century. The Council on Competitiveness is a membership organization of CEOs, university presidents and labor leaders committed to developing an action agenda to drive U.S. competitiveness and productivity, so this hearing is of great interest to our organization and, in particular, our chairman, Chad Holliday, President and CEO of DuPont. The Council has over 120 members including many Fortune 100 companies and top research universities in the country.

One of our members at the Council likes to say that when it comes to competitiveness, Americans tend to veer between complacency and hysteria. On the one hand, many Americans find it hard to conceive of a world where the US is not the global innovation leader. But others point to increasing signs that America's leadership is being challenged in certain areas and could even fall behind if current trends continue. We, as a nation, do not stand on the cliff's edge as some would argue, but instead at a crossroads. Complacency, a defense of the status quo, leads down a path that could take us to the cliff, but at the very least risks subjecting the United States to a slow erosion of economic leadership and a reduced standard of living for its citizens – our ultimate metric for competitiveness, established 20 years ago at the founding of the Council on Competitiveness.. Down the other path lies entrepreneurship, risk taking and a national commitment to innovation that can ensure continued economic growth and prosperity. This divergence will be highlighted later this year when we release the Council's flagship publication, the *Competitiveness Index*, a comprehensive measure of the health of America's economic vitality.

The National Innovation Act introduced by Senator Ensign and Senator Lieberman, and supported by many members of this committee, is a critical part of an action agenda to fuel America's innovation capacity. The Administration, through the President's American Competitiveness Initiative, has endorsed many of the same priorities and, in fact, a tremendous convergence of public and private sector support has coalesced around implementing a national competitiveness plan, underpinned by the power of innovation. The Council is pleased to wholeheartedly support these efforts.

A Strong Foundation

Given America's still dominant position in the world and our leadership through most of the twentieth century, a certain amount of complacency is inevitable. Statistics indicate that our glass is more than half full and we have a strong foundation on which to build our future. Let me share a few key metrics.

- US GDP per capita is among the highest in the world (It has doubled since 1970)
- The US consumer market is the largest in the world by far. It is more than twice the size of Japan's- the next largest consumer market.¹
- While developing nations like China are growing much faster than the US, the US economy is still responsible for a larger share global economic growth than any other country. Over the past five years China has grown more than three times as fast as the US. But since the US economy is 8 times larger than the Chinese economy, that cumulative 3% growth over 5 years added \$1.7 trillion to our economy (an amount that exceeds the total size of China's economy).²
- Total US R&D spending is greater than all of the other G-7 countries combined and accounts for nearly 43% of all R&D spending in the OECD.³
- The US holds nearly 40% of the total global financial stock.⁴
- The United States still leads the world in manufacturing output – as well as in manufacturing value-add.⁵
- Despite a dramatic drop in 2003, the United States remains the top destination for Foreign Direct Investment. China nearly overtook the US in 2003, but the US has bounced back – garnering almost \$96 billion in inward investment in 2004 (compared to China's \$61 billion).⁶

So clearly, the United States is still a global leader and the benchmark for competitiveness. So it would seem as though the complacent among us would have the upper hand and say, continue to do what we have done and not rock the boat.

The Challenge

But all of us in this room know that the waters we must navigate in the future 21st century are not those that propelled us to our safe harbor in the 20th century.

Consider these statistics:

- In 1970 the US enrolled approximately 30% of tertiary level students in the world, and over half of science and engineering (S&E) doctorates were granted by US

¹ Global Insight preliminary data for 2006 *Competitiveness Index*.

² Global Insight preliminary data for 2006 *Competitiveness Index*.

³ NSF, *Science and Engineering Indicators 2006*, p. 4-40.

⁴ McKinsey Global Institute, *\$118 Trillion and Counting: Taking Stock of the World's Capital Markets* (Feb. 2005), p. 16

⁵ NSF, *Science and Engineering Indicators 2006*, p. 6-12.

⁶ UNCTAD, *World Investment Report 2005*, p. 303.

institutions of higher education. In 2001-2002 UNESCO data shows that US enrolled just 14% of tertiary students.⁷

- Asia now spends as much on nanotechnology as the United States.⁸
- Only six of the world's 25 most competitive Information Technology companies are based in the United States; 14 are based in Asia.⁹
- Federal funding of basic research is now only half of its mid-1960s peak of 2 percent of GDP.¹⁰
- Total scientific papers by American authors peaked in 1992 and have been flat ever since.¹¹
- Manufacturing output is lagging that of earlier economic recoveries.¹²

Finally, other countries are adopting America's innovation-led growth strategies and are rapidly moving up in the world rankings. And they are doing it with tremendous focus and intensity. This is a positive development generally, but can and is causing anxiety, particularly in the job market. Satchel Page once said, "Don't look back; someone might be gaining on you." His point that it is important to focus your attention forward always striving to stay ahead is an important one in the context of global competition. While I would argue that a little paranoia is justified given the direction of current trends, we must remain focused on future opportunities to generate economic growth and jobs; not try and recapture the industries and jobs of the past.

As Americans we know that we cannot, nor would we want to, compete on low wages, commodity products, or standardized services, but on high value economic activity – above-the-line activities – that commands a premium in fiercely contested global markets. There will always be a nation somewhere in the world willing to do the work for less. And those nations are hungry for the world's work. At the Council we say, if work is routine, rule-based, if it can be digitized, and reliably codified, there's going to be a low cost source of labor somewhere in the world to compete for that work and for those jobs.

The Role of Innovation

Innovation is the key to meeting these challenges. Beginning with its founding in 1986 in the face of increased competition from the economic engines of Japan, Germany and others, the Council has a long history of private sector-led innovation initiatives. Our first innovation summit was held in 1998 at MIT under the leadership of MIT President Emeritus, Chuck Vest. Three years later the Council hosted a major innovation summit in San Diego and in 2003, we launched the National Innovation Initiative which

⁷ Richard B. Freeman, *Does Globalization of the Scientific/Engineering Workforce Threaten US Economic Leadership?* NBER Working Paper 11457, Cambridge, MA.: National Bureau of Economic Research, 2005.

⁸ Lux Research, *The Nanotech Report 2004*, August 15, 2004. <https://www.global-salespartners.com/lux/>.

⁹ *BusinessWeek*, "The Information Technology 100 Scoreboard," June 21, 2004. http://www.businessweek.com/pdfs/2004/0425_it100.pdf.

¹⁰ NSF, *Science and Engineering Indicators*, 2006

¹¹ NSF, *Science and Engineering Indicators*, 2006

¹² Popkin, Joel and Kathryn Kobe, "US Manufacturing Innovation at Risk," Council of Manufacturing Associations and the Manufacturing Institute, February 2006.

culminated in the release of *Innovate America* at the National Innovation Summit in Washington, DC in December 2004.

The National Innovation Initiative (NII), brought together over a 15 month process over 500 of the country's most talented thinkers and leaders to ponder the changing nature of innovation, the evolution of the global economy, and, most importantly, what the United States needs to do to remain the world leader in innovation. They developed an action-agenda that calls on all sectors of society to work together to solve the great challenges of our day.

Why focus on innovation? Well, our members—CEOs from across industrial sectors, university presidents and labor leaders—firmly believe that innovation will be the single most important factor in determining America's success through the 21st century.

The NII defines innovation as the intersection between ideas, imagination, insight, invention and implementation. We call it, "I" to the fifth power. Fundamentally, it is about the creation of new value. And the Council's long-standing policy research has demonstrated that innovation has been the principal driver of US GDP and productivity growth and a rising standard of living for the past 50 years. More specifically, studies show that total factor productivity—generally attributed to innovation—was responsible for 47% of US economic growth between 2000 and 2004.¹³

But, let me emphasize—for this is crucial to building the public institutions to support new policies and new behaviors—innovation is more than just a driver of economic growth. Innovation has always been the way people solved the great challenges facing society. Today, innovations not yet imagined may enable us to achieve dramatically higher levels of health across the planet; feed vast populations with the protein-based diets essential to health; meet the challenge of a rapidly aging population; find plentiful, affordable, environmentally-friendly sources of energy; and, continually push the frontier of exploration. And innovation will lead to the solution of problems that do not even exist yet and to the opening of new vistas of undreamt of opportunities for ourselves and for future generations.

Innovation has changed tremendously from the days of large industrial research laboratories and ivory tower universities. Where, how and why innovation occurs are in flux – across geography and industries, in speed and scope of impact, and even in terms of who is innovating. We see this transformation in a number of areas.

- The pace of innovation is increasing. For example: while it took 55 years for a quarter of the country to get an automobile, 35 years for the telephone, and 22 years for the radio, it has only taken 16 years for the PC, 13 years for the cell phone and just 7 years for the Internet to penetrate a quarter of the U.S. population (and those trends are just as quick in other countries).
- Innovation has become multidisciplinary. It arises from the intersections of different fields or spheres of activity.

¹³ Global Insight preliminary data for 2006 *Competitiveness Index*.

- At the same time, it is collaborative – requiring active cooperation and communication across organizations, companies, regions and countries. “Co-creation” is the new buzzword.
- Consumers are now in charge as we have moved from a production-driven world to one in which discerning customers are in charge with choice and power.
- And it is rapidly becoming global in scope – with advances coming from centers of excellence around the world.
- Manufacturing and services are merging
 - The sharp dividing line between manufacturing and services is increasingly blurred.
 - Manufacturing companies are transforming themselves from product suppliers into solutions providers—melding services seamlessly into product lines.
 - When they blend like this we’re actually creating whole new markets and market opportunities.

At the same time that innovation has become a global enterprise, the world economy has globalized and integrated at a pace few predicted even 10 years ago. In less than 20 years, many nations have at last embraced market economies and moved toward political democratic norms. And this is a fantastic metric of success for world stability and quality of life. It also means that countries can now compete on traditional cost and quality terms, but they know that it is innovation—the ability to create new value—that will confer a competitive advantage in the 21st century. The playing field is leveling, and the barriers to innovation are falling.

My core message is that America’s long-standing lead in innovation and entrepreneurship is by no means assured. We must create an environment in which innovation can flourish and transformational value can be achieved.

The National Innovation Initiative

This challenge is why the Council launched the National Innovation Initiative – the NII – under the leadership of Duane Ackerman, CEO of BellSouth and Chairman of the Council from 2003-2005. To launch the NII in 2004, Duane asked Sam Palmisano, the chairman and CEO of IBM, and Wayne Clough, the president of the Georgia Institute of Technology, to guide a Principals Committee of 17 other CEO’s and university presidents representing organizations as diverse as American Airlines, AMD, Pepsi, GM, Morgan Stanley, Texas A&M, MIT, Rensselaer Polytechnic Institute, and the University of Michigan. Engaging more than 500 leaders and experts across industry, academia, government and labor, the NII epitomizes the changing nature of 21st century innovation itself—exemplifying a dynamic process of collaboration and competition. This unprecedented group of thought leaders came together to understand the changing nature of innovation in the 21st century, and—even more important—to generate a set of actions for companies, universities, community colleges, state and local government and entrepreneurs to ensure that the United States stays at the leading edge of innovation.

With the release of *Innovate America*, we laid out the challenges we face, the opportunities that lie ahead and the path to get us there.

And since the beginning of 2005 we have worked hard to engage others across the private sector in the work of the NII – starting with our new co-chairs: Craig Barrett, Chairman of Intel Corporation, and Bill Brody, President of The Johns Hopkins University; and, including not only many of the CEOs and leaders from the launch but also new champions – Jeff Immelt of GE, John Chambers of Cisco, Bob Reynolds of Fidelity Investments, Doug McCarron of the United Brotherhood of Carpenters & Joiners, Karen Holbrook of Ohio State University, and many others.

The Innovation Agenda advocated by our NII Leadership Council has three foundational platforms or building blocks —Talent, Investment and Infrastructure. Each platform has three primary objectives and specific recommendations and collectively these recommendations constitute an integrated sustainable path for 21st Century prosperity. Let me just highlight one or two for each of the objectives.

Talent addresses our human capital needs. In this area we have three objectives:

1. Build the base of scientists and engineers
 - For example, by pioneering an extensive portable graduate fellowship program to give control of educational choices back to students. Attract the best and the brightest students and workers from around the world by reforming our immigration system.
2. Catalyze the next generation of innovators
 - By funding internships for innovation-oriented students to experience local startup and small business environments, and,
3. Empower workers to succeed in the global economy
 - Ensure federal job training programs have the flexibility to target the skills needed for the jobs of the 21st century.

The Investment area addresses the balance between risk and reward and the incentives—or disincentives—for people and institutions to invest in innovation. Our priorities here are:

1. Revitalize frontier and multidisciplinary research
 - Increase federal funding of basic research, with an emphasis on the physical sciences.
 - By reallocating 3 percent of all federal agency R&D budgets toward “Innovation Acceleration” grants that invest in novel, high-risk and exploratory research
2. Energize the entrepreneurial economy
 - Catalyze10 Innovation Hot Spots™ at regional locations across the United States over the next five years through public-private partnerships explicitly focused on supporting regional innovation.
3. Reinforce risk-taking and long-term investment
 - Make the R&D Tax credit permanent.

And that brings me to a core reality. Investing in innovation demands adherence to two fundamental principles: a willingness to accept risk and a willingness to wait for the return on investment. Although America's entrepreneurial economy understands and embraces these principles, the much larger financial mainstream may be now moving in the opposite direction. Investment time horizons are getting shorter. Long-term innovation strategies remain undervalued. And business executives in publicly held companies now face a regulatory climate that is blurring the line between business risk and legal risk. Intangible assets, which represent an increasingly large percentage of the value of corporations, still don't show up on the balance sheet, reducing incentives to invest in creating more value. The challenge is transparency, disclosure and corporate governance.

The Infrastructure area covers not only the physical infrastructure that supports innovation but also to the political, regulatory and legal infrastructure that facilitates innovative behavior.

1. Create a 21st century intellectual property regime
2. Strengthen America's advanced manufacturing capacity
3. Put in place a national, coordinated innovation policy with representatives from the public and private sector.

The National Innovation Act and Related Proposals

The National Innovation Act (NIA) and S. 2390, which embodies the provisions of the NIA under the Commerce Committee's jurisdiction, are based largely upon the recommendations included in *Innovate America*, but also are consistent with many of the key recommendations included in reports by the National Academies, Business Roundtable and Presidents Council of Advisors on Science and Technology to name a few. The bills recognize the importance of approaching innovation as an ecosystem requiring investments in talent, research and infrastructure. To be clear, these are still only the federal component to what must be a public and private sector initiative. We, in the private sector, must lead as well and the gentlemen joining me on the panel today can ably describe the efforts their companies are undertaking to support the innovation enterprise.

I will briefly comment on each of the major provisions included in S. 2390:

The Presidents Council on Innovation (PCI) -- To provide for America's future economic security, the President must develop a comprehensive agenda for strengthening U.S. innovation capabilities across government, academia, and the private sector. This cabinet level council would direct innovation policy across the Executive Branch. The PCI would be chaired by the Secretary of Commerce and include other Cabinet Secretaries and Department Heads including Defense, Education, Energy, Health and Human Services, Homeland Security among others. The PCI will develop a National Innovation Policy to foster a dynamic national environment for innovation capacity to ensure the attraction of high value investment to build 21st Century infrastructures across

legal, digital, and physical systems. Among its objectives, the PCI should seek to strengthen America's talent pool of innovators and skilled workers, develop market based incentives and rewards to fuel all stages of the innovation cycle, identify and remove barriers to America's innovative capacity and global competitiveness and stimulate renewed adoption and deployment of innovative infrastructures.

The PCI should:

1. monitor implementation of proposals made in this and similar legislation in the areas of research funding, taxation, immigration, trade, education, regulatory reform and infrastructure development.
2. work with OMB to lead a process to assess the impact of current and proposed policies and rules on US innovation capacity and outcomes.
3. develop metrics for measuring the Government's progress towards improving conditions for innovation in the areas of talent, investment, and infrastructure.

To engage the many constituencies in the "innovation ecosystem" outside the Federal Government, the legislation appropriately calls for the PCI Chair to consult with advisors drawn from the private sector, academia and scientific organizations.

Innovation Acceleration Grants – Investment in frontier research has always been the bedrock of American innovation. Many of the country's most innovative industries were built on decades of research that had no discernible applications. No one dreamed in the 1940s that the esoteric field of quantum mechanics would spawn the semiconductor and IT revolutions. Likewise, engineers working on time-sharing techniques probably never envisioned the worldwide web and e-commerce. And scientists researching atomic motion certainly could not foresee the development of global positioning devices. The United States has led the world in science and engineering thanks in great part to public support of research. In the decades following World War II, industrial labs conducted frontier investigations alongside government agencies. However, in the 1980s, market pressures forced corporations to shift their research focus to projects offering near-term commercial benefit. The lengthy time frames and high risks associated with frontier research – coupled with the inability of investors to capture returns on investment – demanded that the US Government bear the lion's share of responsibility for funding.

In recent years, Washington's commitment to pursuing true discovery – so essential to innovation – has begun to erode. Funding decisions have become increasingly conservative, driven by consensus, precedent, and incremental approaches. Investigators early in their careers, who often have the freshest ideas, are frequently shut out of the peer review process. Further, most Federal grant programs have not kept pace with the changing nature of innovation: Major scientific advances of recent years have drawn from multiple disciplines, and the move from laboratory to marketplace has required creative partnering across the public and private sectors.

At this time of intense global challenge, the nation's leaders must reconnect with America's tradition of exploration and invest public resources in the type of research that,

while promising little in the short run, can lead to new knowledge and breakthrough innovation down the line. Innovation Acceleration grants can go a long way towards meeting this lofty objective. The Council's report recommended 3% of research agencies' budgets be set aside for these grants and this recommendation was echoed and expanded to 8% of research budgets by the National Academies.

One example of this type of program with a successful track record is the Department of Energy's LDRD program in which Lab Directors have a small percentage of their budgets dedicated to a discretionary fund that can be used to support high-risk, projects outside-of-the-box and general mission of the labs with the potential for great return. Indeed, many of the breakthrough discoveries from our National Laboratories can be linked back to the LDRD investments.

A National Commitment to Basic Research – Increasingly, innovation is occurring at the intersection of disciplines, with progress made in one area of scientific endeavor depending on advances in other areas. Medical breakthroughs, for example, now commonly combine modern biology, nanotechnology, information sciences, physical sciences, and engineering. Given the growing importance of multidisciplinary research, government R&D funding cannot be a zero-sum game that shifts resources from one field to another. Investment must be balanced across disciplines. However, recent appropriations have generated a significant imbalance: Federal funding for life sciences has increased four-fold since the 1980s. Over the same period, appropriations for the physical sciences, engineering, and mathematics have remained essentially flat.

The legislative proposals before the Senate appropriately give special attention to the National Science Foundation, and the Departments of Energy and Defense. The President's ACI further highlights the critical role that the National Institute of Standards and Technology plays in this area. The National Science Foundation supports basic research across all disciplines. In FY2002, Congress committed to doubling NSF's budget within five years, but so far, only 16% of that commitment has been met. In addition to bringing much needed balance to the federal research portfolio, this recommendation aims to strengthen the Government's overall commitment to R&D so critical to the innovation enterprise. Whereas in the late 1960s, the federal commitment approached a full 2% of GDP, the current commitment is only 0.8%, less than the percentages spent by Sweden, Finland, Japan, and South Korea. By boosting agency research budgets as proposed, the US Government will move towards a more robust R&D funding level of 1% of GDP.

Development of Advanced Manufacturing Systems – America must design and implement a new foundation for high-performance production. Although America remains the leading producer of manufactured goods, the nation now trails other major regions of the world in manufacturing growth. In 2005, the U.S. trade deficit in manufactured goods was a record \$781.6 billion.¹⁴ This imbalance not only speaks to the continuing erosion of manufacturing employment across the country, but also signals a growing risk to our ability to innovate.

¹⁴ U.S. Department of Commerce, Bureau of Economic Analysis, www.bea.gov.

For US manufacturers to regain their competitive edge, they must embrace and accelerate innovations now occurring in the sector. A new paradigm is emerging – the “extended production enterprise” – in which services, design, and production are integrated in modular fashion. Manufacturers who grew up producing goods under one roof are now functioning as system integrators, managing supply chains or virtual networks of independent business process suppliers. They depend upon cutting-edge software, communications technology, and computing devices and sensors. Beyond technology, companies must adopt new organizational, marketing, and financial models to succeed – focusing on “above the line” priorities to drive innovation and growth. A reinvigorated manufacturing sector is essential to US global competitiveness and security. Viewed more broadly, America’s fundamental ability to innovate depends upon the existence of a cutting-edge manufacturing infrastructure. The extended production enterprise is becoming an integral component of the innovation process, and the nation must invest in research related to manufacturing technology in parallel with the pursuit of scientific breakthroughs.

The federal government should work with industry and the research community to strengthen America’s manufacturing capacity. The growing perception that the United States has “lost its manufacturing edge for good” need not – and cannot – become a reality. Federal resources should be targeted in the following areas: identifying and leveraging technological advantages, enhancing collaboration across the extended production enterprise, establishing shared, cutting-edge production facilities, improving the adaptive ability of small and mid-sized manufacturers, and charting the likely course of innovation in the sector.

Regional Innovation – The United States is not an innovative country – it is an agglomeration of innovative, and less innovative, regions. To optimize our national innovation output regions must implement innovation-based growth strategies. The NIA embraces a key recommendation included in *Innovate America* that argues, for America to prosper, we must help all our regions reach their full potential to support innovative firms and organizations and better integrate economic development and workforce training strategies. Let me make clear that this must be a bottom up process driven by those on the ground in the regions and I believe the language proposed in the NIA is consistent with this goal.

A Consensus for Action

The issue of innovation and competitiveness has recently risen to the level of a first-tier economic priority. The President’s announcement of his new American Competitiveness Initiative at the State of the Union represented the confluence of a number of trends. We’ve seen bipartisan legislation introduced in both the Senate and the House based on the Council’s *Innovate America* report and the National Academies’ *Rising Above the Gathering Storm* report. Last December the Department of Commerce hosted a meeting of CEO’s and university presidents to address the issue with members of the President’s Cabinet, and a few weeks ago, under the leadership of current NII Chairs, Craig Barrett,

chairman of Intel, and Bill Brody, President of Johns Hopkins, over 140 CEOs, university presidents, governors and other leaders joined together to sign an ad that was placed in the *Wall St. Journal* and the *Washington Post*, jointly calling on Congress to act on the innovation issue, and providing an “innovation resource” at www.innovateamerica.org – bringing together under one umbrella key information detailing the latest thinking and activities in the innovation and competitiveness space.

This growing consensus for action is not going unnoticed around the world. Not a month goes by at the Council that we are not visited by representatives from other countries looking for guidance and insight on how to mimic the U. S. model for innovative growth. And we believe it is in America’s best interest to tell them for the global pie is growing and if we are smart and invest in our people, in the creation of new knowledge and in the infrastructure to glean value from these investments; our share of the pie will grow as well. Global competition is not a zero sum game and this is why it is critically important to conclude the Doha Round of trade liberalizations to open global markets and expand the opportunities for global investment and high value economic activity. It has been reported that within a decade, nearly 80% of the world’s middle-income consumers could live in nations outside the currently industrialized world. To maintain our leadership and derive value, jobs and wealth for our citizens will require the commitment of the public and private sectors.

Further, we must collaborate globally on issues such as the measurement of innovation. How we measure innovation, both in terms of inputs – like our investment in R&D, education, etc – as well as in terms of performance will be critical to determining the value of our investments and, at a very basic level, what works and what does not. Many countries around the world are tackling these same concerns and we will be well served to cooperate even as we compete. Companies such as Cisco Systems – as well as our partners in the EU, Japan, Korea, Mexico and Brazil – are working closely with the Council to initiate research in this field.

The Path Forward

Not resting on our laurels, the National Innovation Initiative continues to evolve and with the tremendous support of many of our members we are moving forward with the next generation of programs to build upon the findings and recommendations of *Innovate America*. During the development of the NII Report, Norm Augustine and Chuck Vest led a preeminent panel of advisors who contributed much of the intellectual capital to the final document. We have turned once again to these gentlemen along with David Baltimore, the President of the California Institute of Technology, to head a Strategy Council intended to guide our work in the innovation space going forward. Initiatives around the future of manufacturing, a national high performance computational infrastructure, regional innovation, energy and sustainability in the 21st century, and innovation metrics are being developed as we map out tipping points facing our nation and the actions needed to bolster long-term prosperity in America.

We will follow-up on what we call the NII “over the horizon” initiatives. It is important that we work to extend this agenda at home, in new regions and across the globe in order to maximize the potential for collaborative efforts and the benefits of innovation to our economy. For example:

21st Century Manufacturing – New value creation is the goal of the innovation continuum. This theme was echoed at a meeting held at the Council last week with twenty five experts representing diverse fields of manufacturing. The meeting was a brainstorming session to begin the process of better understanding the role of manufacturing in the American economy and what the future might hold.

We are on the cusp of a technological renaissance in advanced manufacturing with the emergence of desktop fabrication, touch-sense-feel process controls, production slicing, nanoscale manipulation of matter, and the acceleration and transformation of product development through high performance computing tools that will radically change the move from mass production to mass customization. The NII report warned that the nation has been too quick to write-off manufacturing with the 4Ds: dirty, dumb, dangerous—and disappearing.

Indeed, in emerging areas like nano- and biotechnologies, we should balance our leadership in cutting-edge science with leadership in cutting-edge manufacturing (like the Japanese, Germans, and increasingly, the Chinese). In fact, Japan has been repatriating and “black boxing” much of its most advanced manufacturing research, processes and technologies.

We are also in the midst of a process revolution that will require a completely new set of skills and strategies. The Council is poised to undertake an effort to understand better this phenomenon and make recommendations to ensure America’s future manufacturing capacity – a future that will focus increasingly on “above the line” issues (like design, efficient supplies chains, best-of-world customer service, etc) that add value to the manufacturing extended enterprise.

A critical part of this initiative is the power of High Performance Computing (HPC) to drive the manufacturing renaissance. The Council’s groundbreaking three year initiative supported by DARPA, DoE, NSF and NSA to explore the untapped potential of HPC as a driver of economic growth has brought together industry leaders from across all sectors. The goal is to better understand the power of HPC to answer the “what if” questions that could not be addressed even a few years ago and to give the US a competitive advantage.

In today’s competitive global market, HPC has become essential to accelerating innovation, which is one reason President Bush highlighted its importance in his State of the Union address earlier this year. We like to say that “To Out Compete Is to Out Compute.” HPC assists companies in creating new inventions and products; in designing better, more reliable products, processes and services; in minimizing the time to build engineering prototypes; and in streamlining production processes and reducing production costs.

One of America's greatest comparative advantages is our global leadership in HPC...not only manufacturing these powerful systems but applying them to address our most challenging, and therefore most competitively important problems. The Council has a major HPC initiative led by Karen Holbrook, the President of The Ohio State University, and David Shaw, of D.E. Shaw & Co., Inc., to identify the business and technical barriers preventing HPC from being used as aggressively as it could and should be by our companies, the important role of the private sector and what role public/private partnerships can play to address these challenges. HPC must be a key part of regional economic development strategies, as well.

Regional Innovation – Hotspots

Building on the Council's long history in launching the national debate in the mid-1990s around "clusters of innovation" as well our more recent and groundbreaking work on "regional innovation" with the Department of Commerce, we are looking to catalyze the development of "Hotspots" of regional innovation and economic growth across the country. We define a Hotspot as a region that successfully integrates four critical strategies to drive innovation and economic growth: economic development, workforce development, education, and entrepreneurship. HPC can also play a critical role in that process. While data shows that this technology is an important driver of innovation at the corporate and industry level, we also know that increasingly, innovation occurs at the intersection between businesses, research centers, universities, and skilled workers in innovation centers across the U.S. Linking regional HPC assets to address regional challenges can turbocharge the innovation process on the ground and optimize regional economic growth.

Successful "hotspots" also require abundant talent. The good news is that both the Department of Commerce's Economic Development Administration and the Department of Labor (DoL), through their Workforce Innovation in Regional Economic Development (WIRED) program are adopting innovation as a guiding principle in regional economic development. The Council is proud to be a key partner with DoL in the design and implementation of the WIRED program. The NIA would go a long way towards codifying and strengthening this important progress, but most of the work is and should be down on the ground, in the regions.

Since issuing *Innovate America*, the Council has been approached by numerous Governors and others seeking to partner to spur regional innovation-based growth. The Council is planning regional summits in Massachusetts and Ohio in the near term and several other events are in the planning stage. The good news is that many states are moving beyond the view of economic development as a zero-sum game where one tax break might outdo another. Instead, they are turning to innovation as the driver of growth and looking to the assets they have in place to catalyze economic activity. Indeed, the reigning mantra in regional innovation is "earn it, keep it, grow it."

Energy – A 21st century energy infrastructure is one of the linchpins of America's ability to compete in the global economy. The tight linkage between energy and the economy is

not a new concept; every president since Nixon has made energy security, efficiency and diversification a national priority. What is new is that geo-strategic, geo-economic and bottom line interests are converging with technological opportunity -- creating a tipping point for action.

At the same time, the technological options for energy efficiency and fuel and feedstock diversification create significant opportunities to effect real change in the marketplace. At the federal level, the National Energy Plan lays out the urgency to develop reliable and affordable energy supplies. For the first time, perhaps, America's major energy providers are investing hundreds of billions of dollars in alternative energy sources while leading corporations are proving the business case for sustainability. DuPont's CEO, Chad Holliday, recently announced that he expects 25% (up from 10%) of Dupont's products to be made with non-petrochemical substances by 2010.

The nation can rise to the global energy challenge by applying both its capacity for innovation and its ability to forge public-private partnerships that share ideas, talent and investments. Never has it been so critical to create innovative energy solutions that will sustain both our global economic leadership and domestic prosperity. This year the Council will launch an initiative to create a private sector energy roadmap – grounding the nation's investment and policy priorities in the business case for sustainability, diversification and energy efficiency.

Conclusion

Government plays critical roles in enhancing and supporting the competitiveness of American businesses starting with ensuring there is an innovation friendly climate for U.S. enterprises to develop and compete at home and abroad. Today, more than ever before, the government must invest in the long term vitality of our greatest asset, the American people. We must ensure that our children are equipped with the knowledge and problem solving skills through better math, science education that will allow them to reach their full potential as high performing entrepreneurs. Another Council member once commented that "We need artists who can think like engineers, and engineers who can think like artists." These are the small and medium sized business leaders that will drive America's economic growth in the future if government makes the investments in their future now.

Government must accelerate its long standing commitment to invest in research and development at the frontiers of knowledge and ensure that America's universities and colleges remain preeminent in the world. Finally, the government must look for avenues to support the development of an advanced manufacturing capability in the United States that will position us to take full advantage of the investments in research and human capital. At one of our recent meetings, Roger Enrico, former CEO of PepsiCo and now CEO of Dreamworks Animation, talked about the importance of making big changes to big things. Change and progress, he explained, will never come if you don't free yourself from the tyranny of incrementalism. Dramatic results do not come from undramatic action.