INVESTING IN AMERICA'S FUTURE
BARACK OBAMA AND JOE BIDEN'S PLAN FOR SCIENCE AND INNOVATION

Barack Obama and Joe Biden understand that critical national goals can only be met if we renew our commitment to science, technology and innovation. Investments in science and technology foster economic growth; create millions of high-tech, high-wage jobs that allow American workers to lead the global economy; improve the quality of life for all Americans; and strengthen our national security. Clean energy technologies can help end our dependence on foreign oil and combat global warming. Advances in biomedical research can deliver new life-saving ways to diagnose, prevent and treat diseases. And the urge to probe more deeply into the unknown and expand the frontiers of human knowledge is at the core of the American experience.

The U.S. faces unprecedented competition from countries such as China and India that are determined not simply to produce low-cost products and services, but to be at the forefront of developing technologies. America needs a president who understands these challenges and is prepared to make the most of the opportunities they present. We need to end the Bush administration's war on science where ideology trumps scientific inquiry and politics replaces expert opinion. As president, Barack Obama will lead a new era of scientific innovation in America by:

- **Restoring integrity to U.S. science policy** to ensure that decisions that can be informed by science are made on the basis of the strongest possible evidence.

- **Doubling over a 10 year period the federal investment in basic research** by key science agencies**,** with a special emphasis on supporting young researchers at the beginning of their careers, and backing high-risk, high-return research.

- **Making a national commitment to science education and training** by recruiting some of America's best minds to teach K-12 math and science and by tripling the number of the National Science Foundation's Graduate Research Fellowships.

- **Encouraging American innovation to flourish** by making the R&D tax credit permanent, streamlining our patent system, eliminating the capital gains tax on start-ups and small businesses, and promoting the deployment of next-generation broadband networks.

- **Addressing the "grand challenges" of the 21st century** through accelerating the transition to a low-carbon, oil-free economy, enabling all Americans to live longer and healthier lives, and protecting our country from emerging threats to our national security.

I. RESTORE INTEGRITY TO U.S. SCIENCE POLICY

It is essential that federal policy benefit from the most complete, accurate, and honest scientific and technological information available. When federal policy is informed by objective evidence rather than by ideology – whether the concern be national security, energy, global climate change, the environment, health,

healthcare, or investment in education and research – the people of America will be the winners.

Unfortunately, the current Administration has undermined the integrity of U.S. science policy. It has stacked scientific advisory boards, suppressed research that conflicts with its political agenda, failed to make decisions on the basis of the best available evidence, and prevented government scientists from speaking openly with the public and the media.

Barack Obama and Joe Biden are committed to restoring integrity to U.S. science policy. They will swiftly appoint to key federal leadership positions individuals who bring strong backgrounds in science and engineering, as well as a grasp of the practical challenges associated with designing effective national programs. As president, Obama will:

Restore and Enhance the Status of the President's Science and Technology Advisor: Barack Obama will appoint a highly qualified Assistant to the President for Science and Technology who will report directly to him and serve as Director of the Office of Science and Technology Policy. This will reverse President Bush's demotion of the White House science advisor from a senior-level position in the Clinton and George H.W. Bush administrations to a diminished role. This appointee will be announced quickly, in order to participate in critical early decisions and to signal the importance of science, technology and innovation to the entire array of domestic and international policy goals. He or she will be supported by a staff of highly qualified-professionals at the Office of Science and Technology Policy who will collaborate closely with the Office of Management and Budget and other White House offices to craft a strong research budget and design national programs in areas of high priority.

Appoint Individuals with Strong Science and Technology Backgrounds to Key Positions: Obama will appoint individuals with unquestioned reputations for integrity and objectivity to the growing number of senior management positions where decisions must consider science and technology advice. He will take advantage of work of the National Academies to identify the federal government positions that require a strong science and technology background.

Ensure Independent, Non-ideological, Expert Science and Technology Advisory Committees: Obama and Biden will establish clear guidelines for selecting and vetting members of science and technology advisory committees for the White House and federal agencies. It is essential that individuals in advisory roles be widely respected experts of unquestioned integrity and impartiality, who can fairly represent their professional communities and deliver advice that is not biased or partisan. They will also strengthen the role of President's Council of Advisors on Science and Technology (PCAST) by appointing experts to provide unfettered and independent advice on critical issues of science and technology.

Restore Scientific Integrity in Government Decision Making: An Obama-Biden Administration will issue an Executive Order establishing clear guidelines for the review and release of federal and federally-sponsored research, guaranteeing that results are released in a timely manner and are not distorted by ideological biases. This order will rescind the Executive Order issued by President Bush requiring each agency to have a politically appointed "regulatory policy officer" who can prevent career professionals from initiating rulemaking processes. Obama and Biden will also strengthen protection for "whistle blowers" who report abuses of these processes.

II. Expand Investment in Research and Development

Federally supported basic research, aimed at understanding many features of nature—from the size of the universe to the nature of subatomic particles, from the chemical reactions that support a living cell to interactions that sustain ecosystems—has been an essential feature of American life and helped drive our

economic success for over fifty years. While the outcomes of specific projects are never predictable, basic research has been a reliable source of new knowledge that has fueled important developments in fields ranging from telecommunications to medicine, yielding remarkable rates of economic return and strengthening our national security. Barack Obama and Joe Biden believe that continued investment in fundamental research is essential for ensuring healthier lives, discovering more efficient sources of energy, developing superior military capabilities, and generating high-wage jobs for our nation's future.

Yet, today, the United States is clearly under-investing in research across the spectrum of scientific and engineering disciplines. Federal support for the physical sciences and engineering has been declining as a fraction of GDP for decades, and, after a period of growth of the life sciences, the National Institutes of Health (NIH) budget has been steadily losing buying power for the past five years. As a result, our science agencies are often able to support no more than one in five of the proposals that they receive, arresting the careers of our young scientists and blocking our ability to pursue many remarkable recent advances. Furthermore, in this environment, scientists are less likely to pursue the ambitious, but often risky, research that often leads to the most important breakthroughs. We are reducing support for science at a time when many other nations are increasing it, a situation that already threatens our leadership in many critical areas of science.

This situation is unacceptable. As president, Barack Obama will:

Double the Research Budgets of Key Science Agencies over a Decade: Barack Obama and Joe Biden will double budgets of key science agencies such as the National Institutes of Health, the National Science Foundation, the Department of Energy's Office of Science, and the National Institute of Standards and Technology over the next ten years. These sustained and predictable increases in research funding will allow the United States to accomplish much: expanding the frontiers of human knowledge, providing greater support for high-risk, high-return research and for young scientists, and harnessing science and technology to address the "grand challenges" of the 21st century: energy, health, climate change, national security, information technology, and manufacturing capacity.

Actively Encourage Multidisciplinary Research and Education: Because of the depth and breadth of America's research enterprise, the United States has a unique opportunity to lead in multidisciplinary research and education. This is important because the challenges we face, such as the transition to a low carbon economy, can not be addressed by researchers from any single discipline. Moreover, innovation often arises from combining the tools, techniques, and insights from researchers in different fields. Examples of exciting multidisciplinary research opportunities include the convergence of bio-, info- and nanotechnologies.

III. MAKE A NATIONAL COMMITMENT TO STEM EDUCATION

Scientific discoveries have driven the American economy, advanced medical treatments, increased computational capability, and improved the daily lives of Americans. High-quality science, technology, engineering and mathematics (STEM) education can unleash the creativity and curiosity of our students, motivate them to understand our world, and provide them with tools to solve problems, think critically and communicate effectively. It can also inspire Americans to know more about the world around them. High-quality STEM education is essential for not only for those who would become scientists; all students must have equal opportunities to learn 21st century content and skills. Only this can maintain our country's leadership in innovation and create a nation of engaged citizens who can participate in a vibrant democracy and know how to learn for a lifetime in a knowledge economy.

Barack Obama believes the nation can and must dramatically improve STEM education. As President, he will:

Increase the Quantity and Quality of PreK-12 Math and Science Teachers: From the moment our children step into a classroom, the single most important factor in determining their achievement is their teacher. Barack Obama and Joe Biden are committed to transforming the teaching profession and recruiting, retaining, and renewing the professional status of high quality teachers. They will create 40,000 Teaching Service Scholarships of up to $25,000 each for those who are willing to teach in a high-need field or location for at least four years. The scholarships will help bring the best talent to needed fields such as science, mathematics, and technology in order to assure equal educational opportunity for all students. These teachers will help ensure that math and science is part of a rich curriculum from the earliest grades, and that students develop critical 21st century skills. While ensuring that every child has a solid floor of opportunity, Obama and Biden believe we must also make sure that children who demonstrate promise have the chance to develop and expand their skills.

Invest in a Technology Investment Fund: Barack Obama and Joe Biden will build on existing federal education technology programs and create a $500 million matching fund to ensure technology is fully integrated throughout schools. This fund will:

- Integrate technology in the classroom so innovative learning technologies such as simulations, interactive games, and intelligent tutoring systems can assist in improving the quality of learning and instruction.
- Use technology as a base for better methods of student assessments that allow teachers and parents to identify and focus on individual needs and talents throughout the school year.
- Create new technology-based curriculum with leaders in the technology industry so schools can create courses to help students develop high-demand "21st century skills" and work on authentic projects, as is done at High Tech High School or the New Tech High Schools.
- Use technology-supported social networks that allow teachers to work collaboratively with their peers across the country to share best practices and support. .

Leverage National Efforts and Encourage State Collaboration to Improve Implementation: Barack Obama has introduced legislation to establish a STEM Education Committee in the Office of Science and Technology Policy (OSTP) to develop coherence among federal STEM education efforts. This committee will encourage the implementation of successful curricula in science content and process, and the identification of common needs and successes among states, local governments and the private sector, to facilitate development of rigorous standards and to increase the participation of underrepresented populations. In the U.S. Senate, Obama passed three amendments to the America COMPETES Act to increase participation of women and underrepresented minorities in the professions of science, technology, engineering, and mathematics; offer competitive state grants to support summer term education programs to help students develop skills in math and problem solving; and establish a mentoring program for women and minorities as they advance in those fields.

Improve Measures of STEM Learning: An Obama-Biden administration will work with state leaders and educators to ensure that assessments measure the knowledge and skills we value, such as designing and conducting investigations, analyzing and presenting data, and communicating results.

Inspire Americans to Excel in, and Embrace, Science and Engineering: An Obama-Biden administration will establish a communications effort involving the entertainment industry, media and the internet, to help expose young people and the public to the important discoveries, the nature and the limitations of science. It will support the development of partnerships with museums, zoos, libraries, universities, and businesses to

reach out to Americans in their communities and engage them in authentic STEM activities to inspire them to embrace science as a daily part of their lives.

DEVELOP COLLEGE AND UNIVERSITY EDUCATION THAT ASSURES THE SCIENTIFIC FLUENCY OF ALL AMERICANS

Expand and Improve STEM Education in Community Colleges: Community colleges are a vital component of our higher education system. We must capitalize on these institutions by providing incentives to implement new programs that respond to emerging technical career demands and increase numbers of graduates and transfers to four-year institutions. Barack Obama and Joe Biden will create a Community College Partnership Program that will help support enhanced STEM education opportunities at community colleges, and support efforts to that allow students to successfully transition to four-year institutions.

Make College Affordable for All Americans: Barack Obama and Joe Biden will create a new American Opportunity Tax Credit. This fully refundable credit will ensure that $4,000 of a college education is completely free for most Americans, which covers two-thirds of the cost of tuition at the average public college or university and makes community college tuition completely free for most students. Recipients of this credit will be required to conduct 100 hours of public service a year, either during the school year or over the summer months. Barack Obama and Joe Biden will also make sure that the maximum Pell Grant award rises every year with inflation.

Expand America's Research Workforce: The United States needs to encourage more students to pursue graduate education in science and engineering. This will help ensure America's economic competitiveness by providing the future scientific and technical workforce for our universities, national labs, and companies. A good first step will be to triple the number of the National Science Foundation's Graduate Research Fellowships from 1,000 to 3,000. The number of NSF graduate fellowships has remained unchanged since the early 1960s, despite large increases in the size of the undergraduate population and in the role of science and engineering in our society. Barack Obama and Joe Biden are also committed to expanding the diversity of the science and engineering workforce. Full participation by women and minorities in science and technology would do more than just provide needed increases in our skilled workforce, it would also bring a wider range of perspectives, fostering creative and inventive solutions.

IV. CREATE AN ENVIRONMENT THAT WILL FOSTER PRIVATE SECTOR INNOVATION

Although the federal government can invest in the building blocks of innovation, such as fundamental research and a skilled workforce, it is the private sector that must take the lead in developing new products and services. America's "innovation ecosystem" has many strengths, including its world-class research universities, an entrepreneurial culture, and a robust venture capital industry. However, there are many opportunities to improve the environment for innovation – and to keep America at the cutting-edge of the development and adoption of new technologies.

An Obama administration will:

Make the Research and Development Tax Credit Permanent: Obama wants to make the Research and Development Tax Credit permanent so that firms can rely on it when making decisions to invest in domestic R&D over multi-year timeframes. Unfortunately, this credit has been allowed to expire 13 times, and has not been extended since December 2007.

Provide Tax Relief for Small Businesses and Start Up Companies: Barack Obama and Joe Biden will eliminate all capital gains taxes on start-up and small businesses to encourage innovation and job creation. Obama and Biden will also provide health insurance companies a new Small Business Health Tax Credit to

help small businesses provide quality health care to their employees.

Support Immigration Reform: While highly skilled immigrants make strong contributions to our domestic technology industry, there are Americans who could be filling those positions given appropriate opportunities for training. Barack Obama is committed to investing in communities and people who have not had an opportunity to work and contribute to the high-tech economy. We also do not want to shut our doors to innovators from overseas, who have traditionally helped make America strong.

Barack Obama supports comprehensive immigration reform that improves our visa programs to attract some of the world's most talented people to America, including improvements in our legal permanent resident visa programs and temporary programs such as the H-1B program. Obama will:

- Reduce the backlog of skilled immigrants waiting to become permanent residents by increasing the number of employment-based visas.
- Create a "fast track" system that allows foreign students that receive advanced technical degrees from U.S. universities to receive an employment-based visa without having to return to their home country.
- Balance visa and export control policies against the possibility that they deter international scientific exchange or send a message to international students, scholars, scientists, and engineers that they are not welcome to the United States.
- Work to ensure immigrant workers are less dependent on their employers for their right to stay in the country and hold accountable employers who abuse the system and their workers.

Reform the Patent System: A system that produces timely, high-quality patents is essential for global competitiveness in the 21st century. By improving predictability and clarity in our patent system, we will help foster an environment that encourages innovation. Giving the Patent and Trademark Office (PTO) the resources to improve patent quality and opening up the patent process to citizen review will reduce the uncertainty and wasteful litigation that is currently a significant drag on innovation. With better informational resources, the Patent and Trademark Office could offer patent applicants who know they have significant inventions the option of a rigorous and public peer review that would produce a “gold-plated” patent much less vulnerable to court challenge. Where dubious patents are being asserted, the PTO could conduct low-cost, timely administrative proceedings to determine patent validity. As president, Barack Obama will ensure that our patent laws protect legitimate rights while not stifling innovation and collaboration.

Deploy Next Generation Broadband: Barack Obama believes that America should lead the world in broadband penetration and Internet access. As a country, we have ensured that every American has access to telephone service and electricity, regardless of economic status. Obama will do the same for broadband Internet access. Full broadband penetration can enrich democratic discourse, enhance competition, provide economic growth, and bring significant consumer benefits. Moreover, improving our infrastructure will foster competitive markets for Internet access and services that ride on that infrastructure. Obama believes we can provide broadband to every community in America through reform of the Universal Service Fund, in combination with better use of the nation’s wireless spectrum, promotion of next-generation facilities, technologies and applications, and new tax and loan incentives.

V. HARNESS SCIENCE AND TECHNOLOGY TO ADDRESS 21ST CENTURY CHALLENGES

Science and technology can be a powerful ally in addressing some of the most important challenges that the United States faces in the 21st century, including developing clean, affordable sources of energy that reduce the risk of climate change, creating high-wage, high-skill jobs, allowing Americans to live longer, healthier lives, and protecting our country from new threats to our national security.

An Obama administration will encourage the research community to develop solutions to these challenges, and

will create a policy environment that will accelerate the deployment of solutions once they are discovered.

PROVIDE AFFORDABLE CLEAN ENERGY, REDUCE DEPENDENCE ON FOREIGN OIL AND COMBAT GLOBAL WARMING

America's challenges in providing secure, affordable energy while addressing climate change mean that we must both make much more efficient use of energy and begin to rely on new energy sources that eliminate or greatly reduce production of greenhouse gases. Barack Obama will double federally funded clean energy research and development as part of his comprehensive plan to invest $150 billion over 10 years into developing and deploying clean technologies. This initiative will support R&D in areas such as such as:

- New vehicle technologies capable of achieving fuel economies several times that of existing cars and trucks.
- Breakthroughs in energy storage and transmission that would greatly help the economics of new electric generating technologies and plug-in hybrids
- Equipment and designs that can greatly reduce energy use in residential and commercial buildings – both new and existing.
- Technologies for capturing and sequestering greenhouse gases generated by coal plants.
- A portfolio of renewable energy technologies including wind, photovoltaic, solar thermal, ocean technologies, and converting waste and other biomass to electricity and fuels.
- Advances in digital "smart grids" that can optimize the overall efficiency of the nation's electric utility system by managing demand and making effective use of renewable energy and energy storage.
- A new generation of nuclear electric technologies that address safety, waste, disposal, cost, and proliferation risks.
- Barack Obama's energy plan also calls for a series of incentives that will encourage private sector investment in clean energy, including a cap-and-trade system to reduce carbon emissions 80 percent below 1990 levels by 2050, a Renewable Portfolio Standard of 10 percent by 2012, an extended Production Tax Credit for renewable energy production, and a Clean Technologies Deployment Venture Capital Fund.

HELP ALL AMERICANS TO LEAD LONGER, HEALTHIER LIVES

The early detection, prevention, and treatment of diseases such as cancer and heart disease is better today than at any other time in history as a direct result of biomedical research. Barack Obama strongly supports increased investment in biomedical research and education and training in health-related fields, because these investments will provide the foundation for new therapies and diagnostics. Obama takes a broad approach to medical research, but has also been a champion of research specifically focused on cancer, mental health, health disparities, global health, women and children's health, and veterans' health. By making steady increases that double NIH's budget over ten years and by increasing the nation's commitment to public health, the Obama Administration will:

Encourage Rapid Translation of Medical Research into Public Health Benefits: It is essential to reduce the time needed to move scientific discoveries from the laboratory to the clinic and the community. Expanded health research must include the transformation of basic biomedical research findings into to new therapies, improved medical services, and better prevention strategies—all leading to improved healthcare for our citizens. Rapid progress in the understanding of genes, proteins, and the control of cell growth, and new knowledge about the nervous system, metabolism, and behavior place medical scientists in an unprecedented position to confront some of the world's most devastating diseases, including many kinds of cancer, diabetes neurodegenerative diseases like Alzheimer's, and many others. These are opportunities that an Obama-Biden Administration will vigorously pursue.

Advance Stem Cell Research: Human embryonic stem cells have great potential for treating a wide variety of diseases and health conditions and for providing new insights into human development and disease. An Obama Administration will reverse the Bush Administration's ban on federal funding for embryonic stem cell research on cell lines created after August 9, 2001 by executive order and will allow all scientists to participate in this important new field, in accord with the rigorous ethical guidelines proposed by the National Research Council.

Advance Genomics to Improve Medicine: With completion of the Human Genome Project and the advent of new tools for more rapid and less expensive analysis of the genomes of individuals, it will soon be possible to predict susceptibility to many diseases, such as diabetes, several types of cancers, and psychiatric illnesses. The Obama administration will make it a priority to transform basic genomics research into the new field known as "personalized medicine." As a U.S. Senator, Barack Obama introduced the Genomics and Personalized Medicine Act to increase funding for research on genomics, expand the genomics workforce, provide a 100 percent tax credit for the development of diagnostic tests that can improve the safety and effectiveness of drugs, and reaffirm the need to protect genetic privacy. Barack Obama will ensure that the process for reviewing genetic tests is modernized, to allow the nation to capitalize on the tremendous success of the Human Genome Project while protecting the privacy of individuals.

Focus on Prevention and Health Promotion: An Obama administration will increase emphasis on research to promote healthy living and disease prevention, not just in hopes of saving money on medical care, but to enhance the productivity and well-being of all Americans, especially members of disenfranchised groups that have traditionally suffered from poor health outcomes.

STRENGTHEN AMERICA'S NATIONAL AND HOMELAND SECURITY

We need a new technology strategy for America's national and homeland security that will strengthen our military leadership and allow us to reduce the risks from three potentially catastrophic threats: nuclear weapons, biological attacks, and cyberwarfare. Barack Obama and Joe Biden have laid out comprehensive strategies for combating these dangers - strategies that rely on increased investment in science and technology for national and homeland security. An Obama-Biden administration will:

Restore DARPA's Role in Supporting Revolutionary Technological Advances: Historically, the Defense Advanced Research Projects Agency (DARPA) played a critical role in supporting revolutionary technological advances such as stealth technology and the ARPANET – the predecessor to today's Internet. Under the current Administration, DARPA has retreated from its traditional commitment to invest in long-term, high-risk, high-return research. Under an Obama Administration, DARPA will increase its support for longer-term breakthrough research in areas such as microsystems, nanotechnology, information technology, synthetic biology, and advanced manufacturing.

Renew Homeland Security ARPA: Our homeland security R&D has been in disarray, too often staffed by outside contractors with high personnel turnover, and characterized by significant technology implementation problems. The Homeland Security Advanced Research Projects Agency (HSARPA) program was intended to spearhead the development of critical technology needed to protect our country and its infrastructure. Unfortunately, the program has been understaffed and under-funded, and its technology decisions have been repeatedly overruled. Barack Obama and Joe Biden will ensure that HSARPA has a chance to fulfill its intended mission, in partnership with industry and the nation's best university researchers. America's leadership on homeland research and technology development will be reorganized and renewed.

Accelerate the Development of New Medicines, Vaccines, and Production Capabilities for Biodefense: Barack Obama and Joe Biden will build on America's talent in science, technology, and engineering, and the powerful insights into biological systems that are emerging, to create new drugs, vaccines, and diagnostic tests and to manufacture these vital products much more quickly and efficiently than is now possible. Because of the

unpredictability of the mode of biological attack, Obama and Biden will stress the need for more agile and responsive drug development and production systems. This effort will strengthen the U.S. biotech and pharmaceutical industry and create high-wage jobs, while also enhancing preparedness for natural epidemics.

Initiate a Safe Computing R&D Effort: Our cyber infrastructure is fragile and vulnerable to attacks that can cause significant disruption to network operations and the integrity of information. We must enhance our information infrastructure to withstand disruption and to ensure information is not breached or corrupted. Barack Obama and Joe Biden will support an initiative to develop next-generation secure computers and networking for government and civilian applications.

Bolster Defense Manufacturing: The U.S. manufacturing base is eroding which, over time, will jeopardize our ability to develop and maintain the finest defense platforms and systems in the world. The recommendations of the Defense Science Board on defense manufacturing, strengthening efforts at DOD's Mantech program, and at DARPA, must be implemented to develop new manufacturing technologies and processes, to cut manufacturing costs and to accelerate efficiency, so as to assure U.S. manufacturing leadership.

RESTORE AMERICA'S MANUFACTURING LEADERSHIP

We need to restore U.S. manufacturing leadership. We face new low cost competitors in countries like China and India, as well as historic competitors in Europe and Japan. The United States will have to compete through far greater productivity if we are to improve our dangerous trade imbalance and retain employment in key high-wage industrial sectors. Manufacturing leadership is also major national security issue.

An Obama Administration will strengthen U.S. manufacturing:

Develop Next Generation Manufacturing Technologies: The federal government should increase its investment in next generation manufacturing technologies, such as reconfigurable machining tools, solid free form fabrication, advanced sensors that can provide real-time feedback during the manufacturing process, "green" manufacturing, and modeling and simulation tools that can dramatically reduce the time and cost needed to develop and test new products and processes. Obama and Biden will create an Advanced Manufacturing Fund to identify and invest in the most compelling advanced manufacturing strategies. The Advanced Manufacturing Fund will provide grant funds to foster greater collaboration between scientists and engineers in academia and businesses in their communities, and support early-career innovators who seek to implement their job creation proposals in states that have been hardest hit by the decline of U.S. manufacturing. The Fund will have a peer-review selection and award process based on the Michigan 21st Century Jobs Fund.

Double Funding for the Manufacturing Extension Partnership: The Manufacturing Extension Partnership (MEP) works with small and mid-size manufacturers across the country to improve efficiency, implement new technology and strengthen company growth. This highly-successful program has engaged in more than 350,000 projects across the country. In 2006, MEP helped create and protect over 50,000 jobs. Despite this success, funding for MEP has been slashed by the Bush administration. Barack Obama and Joe Biden will double funding for the MEP to bolster the competitiveness of U.S. manufacturers.

ADVANCE INFORMATION TECHNOLOGY

Advances in information technology (IT) are driving economic growth, making our businesses more productive, transforming the conduct of science and the analysis of scientific results, and improving our lives through a rich set of personalized, convenient, affordable services. America is the world leader in the IT industry due to the interplay of universities, industry, and the federal government. Many information technologies that we rely on today have their origins in federally-supported university-based research. The Internet is the most prominent example, but there are dozens of others.

Continued investment is necessary to maintain our leadership and competitiveness. Achieving many of the "societal grand challenges" of this century will depend critically on further fundamental advances in IT. An Obama administration will:

Support a Strong Program of Basic and Applied IT Research: Agencies such as the National Science Foundation, the Department of Energy and DARPA should increase their funding of information technology research. This research should focus key challenges including increasing the reliability, security and privacy of IT systems, providing dramatic increases in computer performance using entirely new approaches such as quantum computing and nanoelectronics, improved ways of communicating with computers including virtual reality and haptic devices, and continued improvement in the speed and flexibility of communications that will permit inexpensive transfers of high quality video, medical images, and complex scientific data.

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Bring Government into the 21st Century: Barack Obama and Joe Biden will use technology to reform government and improve the exchange of information between the federal government and citizens while ensuring the security of our networks. Obama will appoint the nation's first Chief Technology Officer (CTO) to ensure that our government and all its agencies have the appropriate infrastructure, policies and services for the 21st century. The CTO will ensure the safety of our networks and will lead an interagency effort, working with chief technology and chief information officers of each of the federal agencies, to ensure that they use best-in-class technologies and share best practices.

BUILD A 21ST CENTURY TRANSPORTATION SYSTEM

America's transportation system faces many challenges. Every year, Americans spend 3.5 billion hours stuck in traffic at a cost of $63.2 billion a year in lost time and wasted fuel. Although many industrialized nations are reducing road casualties, we seem complacent with a death toll of more than 40,000 per year. Our air traffic control system lacks the resources to install the next generation air traffic control system that is critically needed for managing the growing numbers of flights safely and efficiently.

Decisions made during the next few years will set the direction for American transportation for a generation. With the right leadership we can build a safe, efficient, affordable transportation network that will allow us to realize the potential of a 21st century economy. An Obama administration will invest in the technologies to:

- Develop ultra-high efficiency cars, trucks and aircraft.
- Respond to the safety challenge with research on vehicle and highway safety making full use of new design tools, new materials, and new sensor and communication systems that can prevent crashes and provide early warning of possible hazards.
- Make full use of new information technologies for safe and efficient dispatch of rail and highway vehicles.
- Encourage telecommuting by developing and deploying novel telecommuting and satellite office strategies to minimize travel by federal employees and contractors.

STRENGTHEN AMERICA'S LEADERSHIP IN SPACE SCIENCE

It is essential to maintain U.S. leadership in space. President Bush set forth a bold mission for NASA, but failed to provide the leadership and funding to see it through. As a result, in 2010, the United States will face a five-year gap in the ability to send astronauts to the International Space Station. An Obama administration will restore America's leadership in space science:

- Establish a robust program for human and robotic exploration that preserves our space workforce, engages international allies and draws on expertise in the private sector.
- Close the gap in NASA access to lower earth orbit and better utilize the International Space Station.
- Strengthen NASA's missions in space science, weather, climate research, and aeronautical research.

- Develop a new generation of space vehicles to replace the Space Shuttle scheduled to retire in 2010.
- Improve NASA's educational outreach and programs that promote spin-off consumer technologies.

MAINTAIN AND ENHANCE AMERICAN AGRICULTURAL PRODUCTIVITY

Blessed with natural resources, a heritage of world-class research and technology, and the hard work and ingenuity of generations of American farmers, the United States has seen sustained increases in agricultural productivity for many decades. But this vital sector of our national productivity is challenged: energy costs are rising, climate change is affecting the range of plant and animal pests, and farmland and forest lands are diminishing due to economic and social factors. Rising food prices are having a particularly devastating impact on the world's poor, who spend roughly half of their household income on food. The combination of record food and oil prices is threatening to drive over 100 million people into extreme poverty.

We must take steps to support our food security by investing in research that will improve yields and enhance productivity. As President, Barack Obama will call for increased attention to the basic science that underlies crop and forest productivity, livestock health, and ecosystem stability. Basic research is needed to understand how agricultural systems will respond to changes in climate, the introduction of pests and disease, and bioterrorist incidents, in order how to prepare for these events. Studying genetic and population diversity will enhance productivity and stability of crop systems, and learning how best to prepare for and combat invasive species will make our agricultural sector more resilient.

Obama will also support expanding research to help address the challenges faced by farmers in developing countries, such as developing drought-resistant crops and affordable seed and fertilizer technology.

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Printed in House