

6/24/2011

Senator Bennet:

You asked us to think about how we create an environment in this state, and across the country, that allows innovators and entrepreneurs to thrive. We met over a series of four meetings to discuss the answers to your question. This report sets forth both the challenges and opportunities we have identified in working toward that vision.

The challenges we face fall into six principal categories:

1. Attracting capital;
2. Attracting and keeping businesses in Colorado;
3. Paving the road from innovation to job creation;
4. Ensuring a stable and adequate investment in research and development;
5. Giving small businesses the tools they need to compete; and
6. Creating a competitive regulatory environment.

We also found some fundamental crosscutting principles that we believe are central to a competitive path forward, including:

- Attracting Capital: Our success is dependent on the availability of capital and, right now, capital is scarce. Any path forward must address the challenge of getting more capital into our state, and include ideas on how to attract money into small and emerging companies struggling to advance innovative technology from research and development through commercialization.
- Predictable Business Environment: Government policy must be more predictable and implemented over a longer term. As business leaders, we are deciding now what our strategy for growth will be over the next ten years. It is difficult to partner effectively with a government that is only capable of looking one or two years into the future. Whether it is government funding for research and development, government contracting opportunities or tax policy, we need our leaders to start thinking in terms of the next decade, not the next budget cycle.
- Putting Colorado First: Colorado's federal delegation, state government, and industry must do a better job of working together. We believe that our state's ability to take full advantage of the potential of its innovation-based economy has been hampered by ineffective

communication and political considerations. We all need to do a better job communicating with each other and working together towards a strong Colorado.

- Government Regulation: In an economy where competition is fierce, we are spending a greater amount of time and resources complying with sometimes conflicting federal requirements. We understand the need for regulation, but along with that regulation, we desire a partnership with the government that enables both sides to succeed in making Coloradans better off.
- Workforce Development: All of us rely on the existence of a workforce qualified to work in every sector of our highly technical industries. As you know, our country and state are not doing an adequate job preparing students to work in the STEM disciplines or to help us compete around the globe. We need to do a better job of this at every stage of schooling—from kindergarten through college graduation. The challenge however, doesn't end when students graduate. There must be a path for their skills to be deployed either with an existing company or as part of a start-up enterprise, with the goal that both options exist in Colorado.

In the following pages, we offer numerous policy options to address each of these challenges. Though we all agree that each of these policy options is worthy of consideration, we would like to point out that they do not all have our unanimous support. We ask that you use this document as a starting point for a continued discussion on the merits of pursuing each option as your work towards building the right environment in Colorado for innovation to thrive.

Not all of these ideas can be implemented at the federal level. It is our hope that you share these recommendations with leadership at all levels of government, as part of your commitment to working with them on behalf of Colorado.

We are aware that we are making these recommendations in the midst of a national discussion about our country's immense deficit. Though we strongly support your efforts to put our country on a path towards fiscal sustainability, we also urge you not to lose sight of those investments that will make our country and economy competitive over the long term. We believe that these policy recommendations exemplify the type of investments our country should make to maintain its global competitiveness.

We would like to acknowledge that the "Innovation Economy" includes industries beyond those included here. Other Colorado industries—including information technology, cyber-security, and agriculture---rely heavily on innovation for growth and job creation and are essential components to a strong and vibrant economy in our state. These areas may be the topic for future reviews of this type with a concurrent goal of connecting as many industries in Colorado as possible.

Thank you for your consideration.

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Facilitator:

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Dan Stinchcomb, *CEO, Inviragen, Inc.*

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CHALLENGE 1: ATTRACTING CAPITAL

Our success is dependent on our ability to attract capital investment into our businesses. Any path forward towards improving the environment for innovation and entrepreneurship in Colorado must include policy options address the availability of capital. We must work together to find new ways to attract capital into our state and to encourage investment into early stage companies struggling with advancing technology from research and development through commercialization.

The following policy options include our ideas for attracting capital investment to Colorado and towards every stage in the commercialization process.

Policy Option# 1: Create Tax Incentives for Private Capital Investment in Companies Working Through a Funding Gap.

We recommend creating tax incentives for private investment into companies caught in a funding gap.

Attracting more private investment in technology going through commercialization is an issue for all three of our industries at every stage of development. Funding gaps are especially prevalent in early stage companies stuck in a stage of development that typically does not attract significant private investment. For example, many clean energy companies fall into a gap (or “Valley of Death”) between early stage funding (from the inventors’ own pockets, family and friends, angel investors and venture capital funding) and debt and equity financing at the later stages because the risk and profitability of their technology does not fit into the typical investment parameters for typical capital sources.¹ In many cases, companies caught in this gap may find that there is no capital available to take a promising technology to the next stage of development.

Strategically timed tax incentives will alter the risk of a technology so that it becomes attractive to private investment at stages previously not considered. The uniquely timed tax incentives will need to be structured in a way that makes them limited to those technologies that have the most

¹ *From Innovation to Infrastructure: Financing First Commercial Clean Energy Projects* (June 2010) CalCEF Innovations

potential to get to market and be commercialized but that find themselves in a stage of growth where they are having difficulty attracting private investment.

Policy Option #2: Create a State or Regional Venture Capital Fund

We recommend looking into the possibility of increasing private capital in Colorado through the creation of a Colorado lead state or regional venture capital fund.

The chart below shows the top eight states in the country in terms of venture capital investment.² According to these statistics³, Colorado ranks 8th nationally in venture capital dollars invested in the state, but the difference between Colorado and the national leaders is stark.

State	Level of Venture Capital Investment
California	\$11 Billion
Massachusetts	\$2.3 Billion
New York	\$1.3 Billion
Texas	\$891 Million
Washington	\$613 Million
Illinois	\$575 Million
Pennsylvania	\$508 Million
Colorado	\$468 Million

Source: Pricewaterhouse Coopers, National Venture Capital Association, MoneyTree Report Q4 2010.

We believe Colorado has the entrepreneurial capacity to attract substantially more private investment.

State and regional funds-of-funds can be one effective tool for attracting private venture capital dollars. Colorado has pursued different models for state sponsored venture capital funds in the past with mixed success. We believe Colorado can start a new fund-of-funds, improved with the benefit of our past experience and through the availability of updated investment models.

We recommend you examine the creation of a newly designed state or regional fund with the goal of bringing more focused private capital investment to the innovation economy in our state.

³ Note: a Beacon Hill report ranks Colorado as 3rd Nationally in Venture Capital Per Capita. The feeling of this group is that Colorado should be able to attract more venture capital dollars because of the quality of its industry and not based on the population. To see the Beacon Hill Report <http://www-beaconhill.org/Compete10/Compete2010State.pdf>

Policy Option #3: Create a Refundable Innovation Tax Credit for 50% of Qualified Research Expenses in Bioscience, Clean Energy, and Aerospace.

We recommend the creation of a new Innovation Tax Credit for 50% of qualified research expenses invested by small innovative companies.

As a country, we must do better at attracting private investment into the research and development conducted by small innovative companies. We have one of the highest corporate tax rates in the world, and the incentives we offer to spur investment in research and development are not competitive in terms of size or duration.

The Innovation Tax Credit could be modeled after the successful Therapeutic Discovery Tax Credit. The Therapeutic Discovery Tax Credit was a two-year temporary tax credit program for small companies that invested in “qualifying therapeutic discovery projects.” The credit covered 50% of the cost of qualifying research investments.⁴ Sixty Colorado bioscience companies received more than \$23 million for 102 different projects through this program.⁵

This idea has already proven that it can stimulate private investment into innovation. It also will put the incentives offered in our country for R&D more in line with those offered by our international competitors.

Policy Option #4: Hold a Multi-Industry Conference on Funding and Financing Opportunities

We recommend evaluating the feasibility of a Colorado sponsored multi-industry conference for entrepreneurship and capital investment.

Colorado is failing to attract the private investment it should, given the high quality and quantity of entrepreneurship⁶ and business in our state. The challenge is two-fold: (1) investors do not always intuitively know to look at Colorado for investment opportunity (especially when they have easily accessible projects near their locations usually on the coasts); and (2) Colorado entrepreneurs do not know where to find potential investors for their companies once local resources have been exhausted.

We believe that capital sources for all three of our industries can overlap—an investor willing to invest in a new type of space technology may also be willing to consider new developments in

⁴See a discussion of the tax credit at IRS.gov. <http://www.irs.gov/newsroom/article/0,,id=224513.00.html>

⁵ Colorado Bioscience Association

⁶ According to a recent study, Colorado Ranks 8th in the country in entrepreneurial activity. <http://www.itif.org/files/2010-state-new-economy-index.pdf>

solar panels. A capital conference involving all three of our industries would be an exceptionally large event with the potential to attract new investors to Colorado.

A capital conference alone is not a complete solution to this challenge, but the combined resources of all three industries in one place will be sufficient to attract a level and volume of private investment not yet present in Colorado.

Policy Option #5: Leverage Large Company Investment

We recommend the initiation of a forum for large and small innovation-based companies to discuss working together to spur innovation.

One additional creative way to attract investment is to seek the involvement of larger companies in the state as supporters for developing technologies and small companies.

Creating an interchange that is government-supported but not government-funded among such groups could provide significant benefits. Large companies have investment in R&D and product development built into their business model. They need a systematic way to get universities, federal labs, and small innovative companies to work with them to help develop their research agenda. They also need a forum to discuss ways around intellectual property concerns.

Policy Option #6: Provide a Tax Incentive for Repatriation of Income

We recommend you evaluate the possibility of providing a tax incentive for repatriation of income.

Companies based in the United States are taxed on their income wherever it is made around the world. Foreign corporations only pay U.S. taxes on the income they make in the U.S. As a result, a U.S. business can avoid paying income taxes by operating abroad through a foreign subsidiary. The U.S. firm pays taxes on its overseas earning only when they are paid to the U.S. parent corporation.⁷

Many in our group believe that providing a tax break for repatriation of the income made overseas by U.S. companies would encourage more investment of those funds back into the U.S. economy. The change could be structured so that it is only available to companies that reinvest back into a certified company, project, or technology that would create jobs in the United States.

⁷ "Tax Cuts on Repatriation as Economic Stimulus," *Congressional Research Service* (December 2010).

CHALLENGE #2: ATTRACTING AND KEEPING BUSINESSES IN COLORADO

Even during the worst recession since the Great Depression, we saw our innovation-based industries grow in Colorado.⁸ Our state is 6th in clean energy employment. We have the third largest aerospace industry in the country, represented by more than 400 companies across the state. We have the 6th largest medical device industry in the country, and bioscience in Colorado is represented by more than 1,000 establishments, employing more than 100,000 people. Our state ranks 2nd in SBIR Innovation Research grants, 3rd in high tech employment, and 10th in the number of granted patents.⁹

Many of our economic indicators are strong, but we believe Colorado is in danger of losing its competitive position relative to the rest of the country and the world. Colorado's rankings in per-capita personal income and domination of the aerospace industry have declined in recent years. Over the last few years, our state has been losing venture capital dollars, and export dollars from Colorado are the 4th lowest in the country. Colorado is 48th in spending on higher education putting us at risk of losing our competitive workforce.¹⁰ In addition, a recent report gave our state only a "D+" in its manufacturing efforts.¹¹

Meanwhile, the national and global competition is running full steam ahead. As the Denver Metro Chamber recently stated, "Many of Colorado's competitors are far more focused on what we call 'purposeful economic development.' Countries such as China are acquiring major stakes in rare minerals and playing an increasingly prominent role in the purchase of oil reserves in places such as Canada. Other countries have made giant leaps in the number of scientists, engineers and mathematicians they train for entry into the workforce. For these competitors, the future is now."¹²

⁸ Space employment in Colorado grew 6.5% from 2005-2010 (Colorado Space Coalition); The Clean Tech industry grew by 32% between 2005 and 2010 (Denver Metro EDC); Pharmaceutical and Biotechnology industry employment in Colorado grew 3.9% over the last five years, Medical Device employment in the state grew at almost 10%. (Colorado bioscience association)

⁹ Most of these statistics are from the Denver Metro Chamber, *Toward a More Competitive Colorado*, 6th Addition (2010-2011), the Colorado Space Coalition, and the Colorado Bioscience Association.

¹⁰ Most of these statistics are from the Denver Metro Chamber, *Toward a More Competitive Colorado*, 6th Addition (2010-2011)

¹¹ Conexus Indiana Manufacturing and Logistics 2011 Report Card. <http://cber.iweb.bsu.edu/research/conexus11/>

¹² Denver Metro Chamber, *Toward a More Competitive Colorado*, 6th Addition (2010-2011)

In Alabama, for example, the state and federal delegations are unified and focused on the singular goal of attracting investment to the state. A recent article in the Colorado Springs Business Journal about why Huntsville, Alabama, is beating Colorado Spring in aerospace business recruitment summarized it best: “Huntsville’s success took close coordination by jobs-creation groups, influential political allies, a long-standing commitment to building a diverse economy, generous government incentives and a university that makes technology innovation a top priority.... Huntsville’s recipe for success begins with its [united] approach to economic development.”¹³

We think the following policy options are necessary to make Colorado competitive not only now, but 20 and 40 years from now.

Policy Option #1: Create a Colorado Innovation Economy SWAT Team

We ask that you pull together a Colorado Innovation SWAT Team with the sole purpose of growing and expanding the innovation economy in Colorado. The SWAT Team will do so through taking advantage of new opportunities and staying on top of our state’s existing assets. This group will have the ability to marshal resources in a timely manner across boundaries so that our state can be more competitive for opportunities to strengthen Colorado’s innovation economy.

We recommend the team include representatives from the following offices:

- Every office in the federal congressional delegation;
- The governor or lieutenant governor
- The Colorado Office of Economic Development and International Trade
- The majority and minority leaders of the Colorado Senate and House of Representatives
- One representative from each of the innovation based industries (to be selected by the industry)
- Representatives from the School of Mines, University of Colorado, Colorado State University and Community College systems.

We believe that this idea will only work if participants agree to have their representatives available when an opportunity presents itself. Even if no urgent business exists, we recommend that the SWAT team regularly engage in strategic discussions about Colorado’s economy, including.

- (1) Upcoming Opportunities For Colorado: Through regular discussions, SWAT Team members will learn about opportunities coming to Colorado before they are formally

¹³ Colorado Springs Business Journal, August 20, 2010, “Why Huntsville is Beating Colorado Springs.” Amy Gillentine

announced and will have the opportunity to discuss a Colorado strategy to compete for those opportunities.

(2) Potential Changes at the State and Federal Levels Needed to Help the Innovation-Based Industries Grow: The SWAT Team will keep the door open to industry so that we are learning of regulatory and other obstacles on a regular basis.

(3) Ways to Market Colorado to the Rest of the Country and the World: The SWAT Team can help coordinate a unified message from industry and government—that Colorado is the state to come to for bioscience, clean energy, and aerospace.

Policy Option #2: Hold regular meetings between federal delegation staff and federal agency staff in the state.

We recommend regular meetings between federal delegation staff and the federal administrative and defense agencies.

According to a 2010 study conducted by the Milliken Institute, Colorado ranks 5th nationally in the amount of research and development dollars put into the state. However, as you can see below, the state falls dramatically when looking specifically at federal funding we compete for as a state.

Statistic-	Rank
Academic R&D Dollars per Capita (2007)	19
Average Annual Number of SBIR Awards per 100,000 People (2004-2006)	2
Average Annual Number of STTR Awards per 10,000 Business Establishments (2004-2006)	4
Average STTR Award Dollars per \$1 Million of GSP (2004-2006)	2
Competitive NSF Proposal Funding Rate (2009)	6
Federal R&D Dollars per Capita (2006)	10
National Science Funding per \$100,000 of GSP (2009)	2
National Science Foundation Research Funding per \$100,000 of GSP (2009)	1
R&D Expenditures on Biomedical Sciences per Capita (2007)	20
R&D Expenditures on Engineering per Capita (2007)	25
R&D Expenditures on Life Sciences per Capita (2007)	27
R&D Expenditures on Math and Computer Sciences per Capita (2007)	30
R&D Expenditures on Physical Sciences per Capita (2007)	9
SBIR Awards per 10,000 Business Establishments, Phase I (2006)	4
SBIR Awards per 10,000 Business Establishments, Phase II (2006)	4

Source: Milliken Institute State Technology and Science Index 2010 (not everything involved in the calculation is shown here.)

As a group, we have witnessed specific examples of Colorado missing out. Last year, the Department of Energy offered an E-RIC grant for \$129 million, with additional funds from EDA, SBA and MEP. The Colorado delegation did not provide industry any advance knowledge and there was little coordination as to how to quickly put a team together to respond with a proposal. Colorado companies were not successful in competing for the i9 program last year, and we've lost several opportunities for university outreach assistance centers.

We believe that a closer, consistent and bipartisan relationship between the federal delegation and federal agencies will ensure not only that we know about opportunities in advance, but also will enable our delegation to fight to shape agency grant programs that reward Colorado's leadership in the innovation industries.

Policy Option #3: Create Regular and Meaningful Collaboration between Industry and Research Institutions

We recommend you help encourage regular and meaningful collaboration between Colorado industry and the research institutions in the state. We also recommend you work to improve communication between and the research institutions.

The Colorado Renewable Energy Collaboratory has been effective in providing this collaboration for clean energy. The Collaboratory is a mechanism by which industry can help guide the research that it needs to grow and research institutions can collaborate on projects.

The Colorado Renewable Energy Collaboratory is a research consortium among four leading research institutions—the Colorado School of Mines, Colorado State University, National Renewable Energy Laboratory, and the University of Colorado at Boulder. The research institutions work together with private industry partners to identify research important to industry competitiveness and growth. Using a limited appropriation of state funds to attract industrial and federal funding, the Collaboratory encourages the best researchers in the state to work with one another and with industry partners regardless of institutional affiliation. To date, the Collaboratory has employed approximately \$6 million in state matching funds to leverage more than \$29 million in industry and federal funding for research in Colorado, most of which is focused on applied research with the goal of commercialization.

We believe that both the bioscience and aerospace industries would benefit from integrating the Collaboratory model into their existing infrastructure.

We recommend that you initiate discussions on a path forward towards more collaboration between industry and research institutions and among research institutions in our state.

Policy Option #4: Eliminate Colorado's Business Personal Property Tax.

We recommend continuing to work towards the fiscally responsible termination to Colorado's Business Personal Property Tax.

In Colorado, all personal property is subject to taxation unless it is specifically exempted by statute.¹⁴ Personal property used in a business, or property used to earn income is not exempt. There have been several attempts to eliminate the Business Personal Property Tax. Legislation (introduced by Senator Scheffel, SB 11-026) to phase out the tax over a 40 year period was introduced and failed this year.

The tax discourages upgrading to new equipment and takes away money companies could reinvest more productively in infrastructure, training and similar value add areas. The tax is also duplicative given that we pay a sales tax when we purchase equipment, income and property taxes on our businesses, and the annual business personal property tax.

We understand that our public education system is the main beneficiary of the revenue collected as a result of this tax. As we have indicated in other parts of this report, we strongly support improving public education as essential to enhancing Colorado's competitiveness.

Though we understand the difficulty in achieving this request, we recommend that you look for a way to end the business personal property tax without harming public education in Colorado.

Policy Option #5: Provide Better Employer Education about Workforce Development Funds.

We keep hearing about the money available for workforce development, but finding the applicable funding is difficult.

We have three recommendations to address this challenge:

- (1) Create an updated and easily searchable depository and website for employers with all of the workforce development funding opportunities available.

¹⁴ C.R.S. 39-1-102(16).

- (2) Invite and include greater employer input prior to developing, designating and allocating workforce development funds. Inclusion of employer input early and often will ensure that the money will be channeled into programs that are relevant.
- (3) Create a system by which federal administrative agencies proactively reach out to businesses to inform them of workforce grant opportunities. For example, create an informational reply list that interested companies can sign up for to receive notices when funds become available.

Policy Option #6: Make Colorado's Public Education System the Best in the Country.

We recommend working together to make Colorado's public STEM education the best in the country.

Colorado has one of the most educated populations in the country, but the state's innovation-based industries are still having difficulty finding the workforce to fulfill their needs from within our state. Studies show that the problem will become even more acute in the future. A recent study by the Aerospace Industries Association found that within 10 years, half of the aerospace workforce will be eligible for retirement without the incoming base to replace them in number or in experience.¹⁵ There is no question that the need for an educated workforce in Colorado will grow as some of these measures rapidly accelerate the innovation-based industries.

We all rely on a highly qualified workforce to stay in business, but the pipeline supplying highly-qualified workforce is at risk unless we improve the education that our students are receiving in public school—especially with regard to Science, Engineering, Technology, and Math (STEM) education.

Making our education system more competitive is a national challenge, and Colorado's ability to find a solution is central to meeting our economic development goals and central to attracting the best possible people to our state (and keeping them).

We are past the point where further discussion on this topic is warranted. It is time for leaders at all levels of government and industry to work together to ensure that Colorado starts on the path towards improvement.

We recommend starting a Colorado Education Table modeled after your Innovation Economy Table to explore what it will take to improve Colorado education.

¹⁵ Aerospace Industries Association. http://www.aia-aerospace.org/issues_policies/workforce/facts/

Policy Option #7: Build a Pipeline to Move Workers from School to Industry.

We recommend building a clear pipeline to move workers from school to industry. We believe you could build this pipeline by working off the infrastructure created through the WIRED program in Colorado.

The Department of Labor WIRED (Workforce Innovation in Regional Economic Development) Initiative was a program created to ignite cooperation by incenting companies, workers, researchers, entrepreneurs and governments to come together to create a competitive advantage on a regional basis. The Denver Metro Region (including Larimer, Boulder, Jefferson, Adams, Arapahoe, Douglas, Denver, Broomfield and Weld counties) received a WIRED grant to build a pipeline of workers for “high-demand occupations.” The program ended in January 2010.

We believe that the regional relationships and infrastructure created through the WIRED program could be central to the development of an efficient and steady pipeline for our workforce from school to industry throughout the Front Range. The pipeline must ensure that industry and educational institutions regularly communicate about workforce needs and training development.

We recommend that you coordinate discussions on how to create a steady pipeline from school to the innovation industries throughout Colorado and seek to maintain programs like WIRED.

Policy Option #8: Provide a Forum for Industry and Higher Education to Work Together on a Long Term Plan for Higher Education

Our higher education institutions are responsible for preparing the next generation of scientists and engineers. Our colleges, universities, and businesses need to work together to develop a shared understanding of how to create the right workforce for Colorado industry. We recommend the creation of a forum for industry and higher education to work together on a long-term plan for higher education in this state, including the possible development of more industry training opportunities.

Policy Option #9: Use Colorado as a Pilot Area for Streamlining Immigration Visa Program

Many of our workforce issues stem from a broken immigration visa program. During our discussions, several members of this group cited specific examples of qualified people whom they cannot recruit and hire from overseas because the process is too burdensome. In most other cases, unreasonable delays make the process extremely ineffective for business use.

Our country's inefficient visa program has other impacts detrimental to our economy. Many visa applicants are trained in U.S. universities, but rather than remaining to build companies or assist U.S. companies, they are leaving to do the same in their birth countries. As a result, we are investing in these highly-qualified workers only to lose that investment to other countries.

We recommend that you advocate for a pilot program in Colorado that streamlines the visa program for high-tech workers.

CHALLENGE 3: PAVING THE ROAD FROM INNOVATION TO JOB CREATION

Every technology that eventually makes it to market must go through a commercialization process.¹⁶

We consistently see good ideas fail because they do not have the support they need to make it all the way through development, commercialization and manufacturing of product. Most of the time these roadblocks come in two types: (1) lack of available capital (discussed earlier); and (2) lack of guidance through the process. Removing roadblocks to commercialization is critical to maximizing the potential economic growth possible from the innovation-based industries in Colorado.

Below we have suggested several policy recommendations for removing the capital and informational barriers to commercialization.

Policy Option #1: Create accessible mentoring facilities for innovation-based business.

We recommend the Colorado delegation partner with industry and university leaders to create a *MentorColorado* website to serve as a central portal for all state resources related to entrepreneurship and research commercialization.

Inventors who complete the complex research necessary to create new technology do not always have the qualifications to start a business or take their product through the commercialization process. Mentoring support is needed at all stages of product development to ensure that a good idea makes it through the entire process.

There have been successful early stage efforts in Colorado, like the non-profit Center for Space Entrepreneurship (eSpace). ESpace is currently working to address the need for additional guidance and mentoring facilities for emerging aerospace companies.

In addition to supporting efforts like those at eSpace, we recommend constructing a website for the Colorado innovation-based industries that would provide access to:

¹⁶ The Chart in Appendix 2 summarizes the stages of development for each of the innovation industries.

- Contact information for business leaders who are willing to mentor and who have gone through the process before;
- Contact information for established business incubators;
- Potential investors depending on the product and stage of development; and
- Model SBIR and government grant applications.

The website could be modeled after the Obama Administration's StartUp America website.¹⁷ However, unlike StartUp America, the resources available would be relevant to innovation-based businesses at every stage in the commercialization process in Colorado

Assuming the federal and state governments can provide support for the initial website development, industry and university leadership can work together to ensure its long-term sustainability and provide content for the site.

Policy Option #2: Direct research dollars towards technology transfer.

We recommend committing a small but consistent portion of federal research dollars to technology transfer.

Technology transfer offices—whether offered through a research university, federal lab, or other entity—help an inventor license new technology. Putting federal dollars toward technology transfer will ensure that more of the taxpayer dollars being spent on research and development translate into economic growth and job creation.

Technology transfer offices can:

- Provide advice on intellectual property issues;
- Analyze commercial feasibility of new technology;
- Provide a gateway between industry interested in the commercialization of new ideas and new technology; and
- Provide mentoring and advising to inventors wishing to commercialize new technology.

Right now, no significant federal funding is allocated to technology transfer in the university system. We recommend the establishment of a funding mechanism to encourage and enable this function at research universities. This option would isolate a small percentage of existing R&D funds specifically for technology transfer activities including the identification and dissemination of best practices from research universities that have a proven ability to successfully transfer technology to industry.

¹⁷ <http://www.startupamericapartnership.org/>.

Policy Option #3: Create a process that allows for the transfer of technology into existing companies.

We recommend the development of a structure that will enable the transfer of the new technology developed at federal labs, federal agencies, small innovative businesses, and research universities into existing manufacturers.

Currently, an imperfect model exists to help new technologies move into private commercialization through the creation of new companies or start-ups. Several members of this group have argued that more effective job growth will result in the transfer of technology into existing companies because more money can be focused on product development and manufacture, instead of business establishment and development.

There is a clear need to make technology transfer more efficient. R&D investment at the federal level has created an over-accumulation of intellectual property, including 14,000 unlicensed patents at the Department of Energy alone.¹⁸

The Colorado Association for Manufacturing and Technology (CAMT) is currently working with NASA to create one solution to this challenge. CAMT has proposed a new model that would make it easier and more efficient to transfer technology into the hands of existing manufacturers. Their program would:

- Provide technical assistance services to existing Colorado manufacturers in the areas of technology transfer, new product development, and export capability;
- Offset the initial cost of acquisition of clean technology R&D from national labs, universities and small innovative companies; and
- Fund their conversion to prototypes at existing manufacturer sites.¹⁹

We recommend supporting efforts like those being pursued by CAMT and those being initiated by technology transfer offices in the state

¹⁸ Accelerated Economic Development Model: Direct to Manufacturers, Clean Technology R&D Transfer in Colorado, CAMT, Dr. Elvir Causevic, Executive Director and Elaine Thorndike, CEO

¹⁹ Accelerated Economic Development Model: Direct to Manufacturers, Clean Technology R&D Transfer in Colorado, CAMT, Dr. Elvir Causevic, Executive Director and Elaine Thorndike, CEO

Policy Option #4: Streamline Patent Approval by Creating Regional Patent Offices

Even as Congress reforms the procedures of the U.S. Patent Office, there are considerable technological gaps in the agency's operations. The gaps affect the time it takes for patents to be approved. As the USPTO takes on new responsibilities, it will be important to make sure the agency has the resources it needs to address backlogs and modernize in order to ensure short and long term efficiency. Part of improving this efficiency is the establishment of regional satellite offices across the country, including one in Colorado to cover the Rocky Mountain region. In order to ensure the effectiveness of the satellite offices, investing in the modernization of the USPTO will be essential. A one-time investment will go a long way toward providing certainty in our patent system.

CHALLENGE 4: ENSURING STABLE AND ADEQUATE FEDERAL INVESTMENT IN RESEARCH AND DEVELOPMENT

The importance of funding for research and development to our country's global competitiveness is recognized throughout the political spectrum. As industry leaders, we can say without hesitation that federal funding for research and development is essential to our ability to stay ahead of the international competition. Both Presidents Bush and Obama supported increasing our country's investment in federal R&D funding in an effort to make sure our country continues to lead the world in scientific and technological innovation.

Despite its importance to our economy, we as a country have lacked a clear vision and commitment to both federal investment in research and development and to federal incentives to encourage private investment in R&D. We believe that committing to an improved and long-term vision for R&D funding will help our country and Colorado become more competitive.

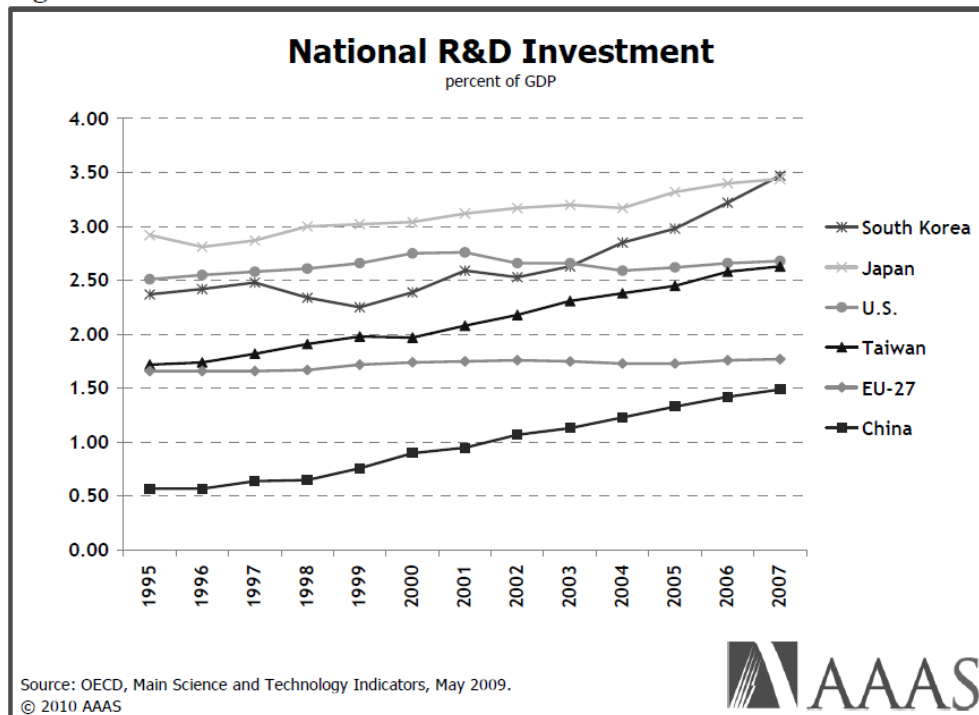
The following policy options address the issues surrounding both private and federal funding for research and development.

Policy Option #1: Lead a bipartisan agreement on a long term federal research and development investment strategy and make sure the authorized funding gets appropriated.

We recommend you lead a bipartisan group towards agreement on a 5 year plan and appropriation of federal investment into research and development.

The federal government is the nation's largest supporter of basic research funding.²⁰ However, even with bipartisan political support, the data shows that our country is not growing our investment in R&D as quickly as other countries.

²⁰ NSF, *New NSF Estimates Indicate that U.S. R&D Spending Continued to Grow in 2008*, NSF 10-312, January 2010. Note that that funding is divided as follows: 51.8% to DOD, 21.9% to HHS (NIH), 8.8% to DOE, 4.3% to NSF, and 1.5% to Department of Agriculture. (Congressional Research Service, "Federal Research and Development Funding: FY 2012")

Figure 5. National R&D Investment as Percent of GDP

In addition, we have been unable to settle on a plan for funding research and development over the long-term. During the Bush Administration, Congress passed a seven-year plan to double our nation's investment in research and development. That plan passed, but money to fulfill the authorization was never appropriated. President Obama has also offered a plan to double research and development funding, but given the current budget situation there is no certainty that the plan will be implemented.

Perhaps more damaging over the long term than cuts to funding is the lack of stability in investment. In recent years, major influxes of funding have sparked immense growth in research and development projects. However, the stability of this funding is in jeopardy given the tone of current budget negotiations. This spring's budget agreement, for example, included cuts to federal R&D spending including reductions of \$260 million to NIH, \$53 million to NSF \$119 million to NOAA and \$170 million to NIFA and ARS (from 2010 levels). The threat of diminishing R&D funding not only hurts our country's competitiveness, it is a waste of previously allocated resources. Projects which received initial funding in past years are subject to cancellation or postponement now, wasting our previous investment.

Throughout the conversations about controlling the federal deficit, leaders on both sides of the aisle have committed to prioritizing the spending we need to make our country more competitive over the long term. We should attempt to provide consistent funding for R&D projects to the point at which some value may be realized from the work effort.

Policy Option #2: Reform the Federal Research and Experimentation Tax Credit.

We recommend reforming the Federal Research and Experimentation Tax Credit so that it is more competitive to the incentives offered by other countries.

The current Research and Experimentation Tax Credit provides a credit for approximately 20% of a business' Qualified Research Expenses spent beyond its base amount. A base amount is about the amount the firm would spend on qualified research without the credit. The tax credit was extended through the tax compromise in December 2010 through 2011.²¹

The current credit is: (1) not large enough to be competitive with other countries; (2) unpredictable and has only been extended for the short-term; and (3) non-refundable so companies that are not profitable and have no tax liability (meaning most companies in the beginning stages of growth and development) do not benefit.

As a tangible example of an alternative policy, Canada provides two permanent incentives for investment into research and development. First, the country allows all companies to deduct all of their qualified R&D expenses. More importantly, Canada offers Science Research and Experimental Development (SR&ED) tax credit. The credit allows large Canadian corporations and foreign controlled corporations to claim a 20% non-refundable tax-credit to be used to offset taxes in the current year, in the previous three years, or in the next 20 years. There is no ceiling on this deduction. It also allows small Canadian-controlled private corporations to receive a refundable tax credit of 35% of qualifying current and capital SR&ED expenditures, to a maximum of \$3 million of such expenditures per year. The credit for anything over the \$3 million is 20%, of which 40% may be refundable.²²

A stronger and longer term R&E tax credit will stimulate private investment into innovation. It also will put the incentives offered in our country for R&E more in line with those offered by our international competitors.

Policy Option #3: Create a list of funds and grants available by agency.

We recommend creating an easily searchable database of available grant or research funding opportunities.

²¹ "Make Research and Experimentation Tax Credit Permanent," Tax Policy Center.

http://www.taxpolicycenter.org/taxtopics/2011_RandE_credit.cfm

²² "Do Your Research in Canada, It Pays Off," Foreign Affairs and International Trade Canada, January 2010.

<http://investincanada.gc.ca/eng/publications/rd-tax-credit-fact-sheet.aspx>

Information about federal and state grant opportunities is available, but it is divided by agency and is often difficult to find. New businesses in particular have difficulty figuring out where to look and whether they qualify for any federal grant opportunities.

We believe this problem could be solved through the creation of a centralized database for all federal grant opportunities. This database should be easily searchable so that new businesses not accustomed to finding federal grant opportunities can easily access information that lets them know what is available and the requirements for obtaining the grant.

CHALLENGE #5: GIVING SMALL BUSINESSES THE TOOLS THEY NEED TO COMPETE

Innovation-based small businesses are essential to the strength of our industries and are some of the most susceptible to funding gaps and market fluctuations. All of the recommendations listed above will help small businesses in our industries grow. The options below will help small businesses specifically.

Policy Option #1: Extend 100% Capital Gain for Qualified Small Business Stock

We recommend making the 100% Capital Gain Deduction for Qualified Small Business Stock permanent.

Last December, the tax compromise temporarily extended the 100% Capital Gain and AMT Exclusion for Qualified Small Business Stock Investments. Qualified Small Business Stock is stock acquired in an original issuance from the corporation in exchange for money or other property as compensation for services.

Last year's extension has already helped small businesses in Colorado leverage the use of capital and grow. This tax relief was only offered for about one year and we believe it would be a much better tool if businesses could rely on its existence indefinitely.

We recommend making this extension permanent.

Policy Option #2: Extend Shortened Depreciation

We recommend extending shortened depreciation for at least 2 years.

As a result of the December 2010 tax extension package, businesses are permitted to deduct 100% of business expenses that usually must be depreciated and deducted over a period of several years. The provision has been extremely helpful to the innovation-based industries and has led in part to the reversal of the decline in investment.

The 100% depreciation expires at the end of 2011. We recommend extending this provision for an additional two years.

Policy Option #3: Provide an Alternative Track (or Phase 3) for SBIR Grantees When their Technology is Not Purchased by a Government Agency.

The SBIR program has two basic objectives: (1) to increase the participation of small business in the federal government's technological development, and (2) to encourage the expanded commercialization of federally funded R&D.

The SBIR program is usually conducted in three phases. Phase I SBIR grants fund investigation into scientific and technical merit and feasibility of the proposed project. Phase II grants fund principal R&D.

Currently, companies have two options once their technology is through the SBIR I and II process (sometimes called Phase III SBIR):

- (1) The federal government wants the technology for its own use, and it purchases the technology from the small business that created it; or
- (2) The federal government does not purchase the technology and the small business pursues commercialization with the help of a small SBIR Phase 3 grant or independently.

It is very difficult for small companies to get the funding they need to bring advanced technologies to market after completion of the first two stages of the SBIR program. NASA has introduced an interesting model for filling this gap through its Space Technology Research Program that could be applied to other agencies. NASA's new approach provides support for moving the technology into the market even if the government does not seek to use it.

Whatever the final model, we recommend beefing up the SBIR Phase 3 grant program so that it provides grants for small companies who have gone through the SBIR program to commercialize their product.

Policy Option #4: Shorten the Time it Takes to Get SBIR Grant Awards

We recommend taking a close look at the SBIR program and shortening the time between application and grant award.

The time between an award of an SBIR grant and the allocation of money is often too long for small businesses and they can't afford to wait.

We would like you to look into shortening the length of time between application and award in the SBIR program.

CHALLENGE #6: EXCESSIVE GOVERNMENT REGULATIONS

Though each of our industries interacts with different federal agencies, we are all hampered by a federal regulatory structure that seems more intent catching our mistakes, than working with us to help us succeed. In an economy where competition is fierce, we are spending greater and greater time and resources complying with sometimes conflicting federal requirements.

We understand the need for regulation, but along with that understanding we desire a partnership with the government that enables both sides to succeed in making Coloradans better off. Several states have initiated a process under which excessive, redundant or wasteful regulations are examined and if determined not to be needed, eliminated. We recommend that you look into pursuing a similar effort at the state and federal levels.

APPENDIX 1: COLORADANS FOR AN INNOVATION ECONOMY**Co-Chairs:**

Mark Sirangelo, *Executive Vice President, Sierra Nevada Corporation*

Mark Sirangelo is currently Executive Vice President of Sierra Nevada Corporation (SNC), responsible for the company's Space System Group and is also Chairman of the SNC Space System Board. From 2005 to 2008, Mr. Sirangelo was CEO and Chairman of SpaceDev Incorporated, which was acquired by SNC in December of 2008. Prior to his tenure at Space Dev, Mr. Sirangelo was the managing member and Chief Executive Officer of The Quanstar Group, LLC, an advanced technology development organization. Earlier he founded and managed two leading communications companies.



Holli Riebel, *President and CEO, Colorado BioScience Association*

Holli is currently the President and CEO of the Colorado BioScience Association. The organization represents Biotech, Pharma, Medical Device, AgBio, and Bioinformatics subsectors representing over 350 members. CBSA focuses its attention on elevating the awareness and impact of the Bioscience Industry in Colorado as well as, acting as an advocate of the industry to ensure a healthy business environment, creating legislation to fund early stage companies and discoveries born out of research institutions, marketing the bioscience industry, and providing over 50 educational events per year for its members. Previously, Holli had worked as an economic developer for over 22 years. Most recently she was the Vice President of the Metro Denver Economic Development Corporation spanning 2003 thru 2010. She managed the coordination of over 60 metro Denver communities in the nine-county region in their economic development efforts. Before working at the Metro Denver EDC, she was the Vice President of the Jefferson Economic Council for seven years, a countywide economic development organization. Holli received her Bachelor of Science degree in Business from the University of Colorado. She is also certified as an Economic Development Finance Professional by the National Development Council.



Ron Sega, *Vice President and Enterprise Executive for Energy and the Environment at Colorado State University (CSU) and The Ohio State (OSU).*

Dr. Sega is Vice President and Enterprise Executive for Energy and the Environment at both Colorado State University (CSU) and The Ohio State University (OSU). He is also the Woodward Professor of Systems Engineering. Dr. Sega was Director of Defense Research and Engineering, the chief technology officer for the Department of Defense (DoD), from 2001-2005. He retired from the Air Force Reserve in 2005 as a major general in the position of reserve assistant to the chairman of the Joint Chiefs of Staff after 31 years in the Air Force. He most recently was the Under Secretary of the Air Force from 2005-2007 where he served as the DoD Executive Agent for Space and led the Air Force team. A former astronaut, he flew aboard Space Shuttles Discovery (1994) and Atlantis (1996). He holds a B.S. in math and physics from the U.S. Air Force Academy in Colorado Springs, an M.S. in physics from Ohio State University and a Ph.D. in electrical engineering from the University of Colorado.



Facilitator:

David Hiller, *Executive Director, Colorado Renewable Energy Collaboratory*

David Hiller is executive director of the Colorado Renewable Energy Collaboratory, a research coalition group including members from the U.S. Department of Energy's National Renewable Energy Laboratory, the Colorado School of Mines, Colorado State University and the University of Colorado at Boulder. Hiller is a former staff member and advisor to Interior Secretary Ken Salazar.



Members:

David Allen, *Associate Vice President for Technology Transfer, Technology Transfer Office, University of Colorado*

David N. Allen came to the University of Colorado in February 2002. As AVP he has responsibility for intellectual property (IP) and technology licensing matters across the three CU campuses. Previous to Colorado, Dr. Allen was the AVP for Technology Partnerships at the Ohio State University. Before coming to Ohio State in 1997, Dr. Allen was AVP for Technology and Economic Development at Ohio University in Athens. Previous to Ohio University he was a Professor at The Pennsylvania State



University, University Park. During the 1981 to 1991 period he held positions first in the College of Liberal Arts and then in the Smeal College of Business Administration. While at Penn State, he was a consultant to a seed venture capital firm. He earned a Ph.D. from Indiana University, Bloomington in Political Economy in 1980. His PhD advisor, Elinor Ostrom, was a co-recipient of the 2010 Nobel Prize for Economics.

Brian Blackman, *Director of Corporate Development, Ascent Solar Technologies, Inc.*

Brian Blackman is currently the Director of Corporate Development and Government Relations for Ascent Solar Technologies, Inc. based in Thornton Colorado. Brian is focused specifically on Defense/Humanitarian solar applications that can help shape the use of rapidly deployable power generation. Brian has been involved in the Clean-Tech industry for over 7 years and many of those with Ascent Solar. has extensive knowledge of the renewable energy industry and the dynamics that are shaping the industry today as well as tomorrow. Ascent Solar is a flexible thin-film solar manufacturer that is enabling the next generation of how we use solar in a day to day environment.



Kim Burquest, *CEO, AdamWorks, LLC*

Ms. Burquest is the founder and CEO of AdamWorks, LLC, a small, veteran-owned engineering and manufacturing company for the Aerospace and Defense Industry, located in Centennial, Colorado. Established in 2007, AdamWorks has grown from a start-up of two, to a profitable business employing 30 people and expanding rapidly. Prior to founding AdamWorks, Ms. Burquest worked for fifteen years in management and mergers and acquisitions in multiple industries including software, retail and manufacturing. Having spent her career specializing in rapid growth organizations, she has managed the attraction and retention of employment from dozens to thousands, applying innovative strategies for recruiting, motivating and managing the top talent in each of the industries in which she has worked to ensure the successful execution of the business mission. Ms. Burquest has been a Colorado resident for over 13 years and is a member of Women in Aerospace and Women in Defense. She holds a BA in Psychology from DePauw University and an MBA from the University of Colorado, Denver.

Sunil Cherian, CEO, Spirae

Dr. Cherian is the founder and CEO of Spirae, Inc. based in Fort Collins, Colorado. Spirae develops infrastructure solutions for distributed energy and smart grid applications and co-owns and operates the InteGrid Test and Development Laboratory in collaboration with Colorado State University. Prior to Spirae, Dr. Cherian founded Sixth Dimension, Inc. for providing networking technologies for the energy industry and served as its CEO from 1997 until 2002. Dr. Cherian has extensive experience in distributed energy applications including renewables integration, aggregated distributed generation for peak shaving, wholesale trading, and congestion management; load aggregation and workflow management for demand response; and service delivery infrastructures for Energy Service Providers. He also serves on the Boards of the Northern Colorado Clean Energy Cluster and Colorado Cleantech Industry Association. He earned his M.S. and Ph.D. degrees in Mechanical Engineering from CSU in 1991 and 1995 respectively.

**Tom Clark, Executive Vice President, Metro Denver Economic Development Corporation**

Tom Clark is Executive Vice President of the Metro Denver Economic Development Corporation and the Denver Metro Chamber of Commerce. He has over 30 years of economic development experience at the state, regional, county and city levels. Tom's career spans four decades from Director of Commercial and Industrial Development for the Illinois Department of Commerce and Community Affairs, through positions with the Fort Collins, Colorado Chamber of Commerce, the Greater Denver Corporation, the Boulder Chamber of Commerce, the Jefferson Economic Council, and the Denver Metro Chamber of Commerce. He holds bachelor's degrees in speech and psychology from Minnesota State University and a Masters in Public Administration from the University of Illinois. Tom was the founder and first president of the Metro Denver Network, the Metro Denver region's first economic development program, for which he received the Arthur D. Little Award for Excellence in Economic Development. He was chosen as one of the nation's top economic development professionals by the Council on Urban Economic Development.



Diane Dimeff, *Executive Director, eSpace: The Center for Space Entrepreneurship*

Diane Dimeff is the executive director of eSpace where she oversees the three programs the Center offers: The Aerospace Business Incubator, the Straight to Space workforce development program, and the Venture Design Program with CU Boulder. She also teaches entrepreneurship, market analysis and strategy in the CU graduate projects course. In addition to her work with a wide variety of educational institutions, Diane has been a consultant with the San Francisco office of KPMG Peat Marwick (now BearingPoint), and is an accomplished author.

**Charles Eggert**, *CEO, OPX Biotechnologies, Inc.*

Chas is applying more than 30 years of experience in the global specialty-chemical industry to the leadership of OPXBIO. Prior to joining OPXBIO in September 2008, Chas was president of the Specialty Polymers Group, a \$500 million revenue division of Akzo Nobel. Earlier, he held top management responsibility for the Food Ingredients - Europe and global Personal Care business units of ICI prior to the acquisition of ICI by Akzo Nobel. While at ICI, he was a board director of the American Chemistry Council. Chas began his career with Monsanto Company, progressing through roles in technology, manufacturing, business development, marketing, and general management. His work at Monsanto included an assignment as vice president of Monsanto Venture Capital. Chas is a board director of the Biotechnology Industry Organization (BIO), as well as a founding director and vice chairman of the Colorado Cleantech Industry Association. Chas earned an MBA in marketing and finance from Washington University in St. Louis and an M.S. in biochemical engineering from the University of Minnesota. He also holds a B.S. in chemical engineering from Washington University.

**Don Elliman**, *Executive Director, Charles C. Gates Center for Regenerative Medicine and Stem Cell Biology*

Don Elliman is the Executive Director for the Charles C. Gates Center for Regenerative Medicine and Stem Cell Biology. While in state government, Mr. Elliman served as Chief Operating Officer for Colorado, Chair of the Colorado Recovery Accountability Board, and Director of the Colorado Office of Economic Development and International Trade. He was President of Kroenke Sports Enterprises from 2000-2004 overseeing all business activities of the Company which include The Pepsi Center, The Denver



Nuggets and The Colorado Avalanche. Prior to his time at Kroenke, Mr. Elliman worked at Time Warner for thirty-two years, retiring as an Executive Vice President of Time Inc.

Jeffrey Forbes, *Professor and Chair, Department of Aerospace Engineering Sciences, University of Colorado*

Dr. Forbes holds the Glenn Murphy Endowed Chair and is Professor and Department Chair of the Department of Aerospace Engineering Sciences, University of Colorado at Boulder. He received his Ph.D. in Applied Physics from Harvard University in 1975 and held appointments at Boston College and Boston University before joining the CU faculty in 1993. He retired from the U.S. Air Force Reserves in 1994. He regularly serves on a variety of national panels and committees, is currently Chair of the Academic Affairs Committee of the American Institute for Aeronautics and Astronautics (AIAA), is co-founder and member of the eSpace Board of Directors, and is a Fellow of the American Geophysical Union.



Dale Gardner, *Associate Laboratory Director for Renewable Fuels & Vehicle Systems, National Renewable Energy Laboratory (NREL)*

As the Associate Director for Renewable Fuels & Vehicle Systems at the National Renewable Energy Laboratory (NREL) in Golden, Colorado, USA, Mr. Gardner oversees the applied research and development activities for biofuels, fuel cells and hydrogen, and advanced transportation technologies within the Laboratory. These efforts support national energy initiatives conducted by NREL's National Bioenergy Center, the Hydrogen Technology and Systems Center, and the Center for Transportation Technologies and Systems, respectively. He is also the Co-chairperson of the Member Governance Board for the National Advanced Biofuels Consortium. During his first two years at NREL Gardner served as the laboratory's Associate Director for Systems Integration. Previously he was with TRW Inc and Northrop Grumman Corporation in Colorado Springs, the National Aeronautics and Space Administration (NASA) at the Johnson Space Center in Houston Texas, and the U.S. Navy. He has a B.S. degree in Engineering Physics from the University of Illinois, Champaign/Urbana, Illinois, USA.



Michael Gass, *President and CEO, United Launch Alliance*

As President and CEO of ULA, Gass serves as the principal strategic leader of the organization and oversees all business management and operations. Before joining ULA, Gass served as vice president and general manager of Space Transportation for Lockheed Martin Space Systems Company, responsible for Atlas, Titan, and Advanced Space



Transportation product lines and all launch activities. Prior to this assignment, Gass served as vice president, Atlas/Evolved Expendable Launch Vehicle programs, for Lockheed Martin Space Systems and as vice president of the Atlas launch vehicle program. He was responsible for the Atlas II, III, and V launch vehicle programs and held additional senior operational and management positions. Gass attended the Sloan Fellows Program at the Massachusetts Institute of Technology where he received a Master's degree in management. He also graduated from Lehigh University with a Bachelor of Science degree in industrial engineering.

Steve Orndorff, CEO, Ariel Pharmaceuticals

Steve Orndorff is a serial entrepreneur with 30 years experience in the biotechnology industry, and founder of three biotech companies in Colorado over the past 15 years. Currently Dr. Orndorff is the founder, President and CEO of Ariel Pharmaceuticals, a startup specialty pharmaceuticals company focused on orphan diseases and acute medical conditions of neurological origin. He is also the former founder, President and CEO of Accera, Inc., and of Univera Pharmaceuticals, Inc., a drug discovery company focused on diseases of inflammation and the immune response. During his career he has had responsibility in a broad array of disciplines such as basic research, manufacturing, product development and business development at various biotechnology companies including Genex Corporation, Monsanto NutraSweet division and ZeaGen, Inc. Dr. Orndorff is a past President of the Society for Industrial Microbiology and a founding board member of the Colorado BioScience Association (CBSA). Currently he is chairman of the CBSA. He received a B.S. degree in Biology from Virginia Tech and a Ph.D. in microbiology from University of Maryland.



Kenn Quick, Chair, National Defense Industry Association

Kenn, located in Colorado Springs, CO, has provided consulting services and functional training programs on business development, change management, procurement and acquisition management for the public and private sectors for 21 years. He has served as President of the Pikes Peak Chapter of the National Contract Management Association (NCMA), as Director of the NCMA's International Organizations Group and on the nation's Region VIII Small Business Advisory Council. During his U.S. Air Force career Ken served at the Directorate of Contracting, Air Force Computer Acquisition Center (AFCAC), Hanscom AFB, MA and Headquarters U.S. Air Force Space Command, Colorado Springs, CO.

Tim Rodell, President and CEO, GlobeImmune, Inc.

Dr. Rodell has been President and Chief Executive Officer of GlobeImmune, Inc. since 2004. From 1999 until 2002, Dr. Rodell was President and Chief Executive Officer of RxKinetix, Inc., a private drug delivery company that was sold to Endo Pharmaceuticals Holdings Inc. From 1996 until 2000, he held a number of positions at OXIS International, Inc., including Chief Technology Officer and President of OXIS International, SA, the company's French subsidiary. Dr. Rodell is also a founder of Barofold, Inc., a protein re-folding company. Before moving to industry, Dr. Rodell practiced academic Emergency Medicine, Internal Medicine and Pulmonary and Critical Care Medicine. Dr. Rodell earned his M.D. from the University of North Carolina School of Medicine in 1980. He is board certified in Internal Medicine and Pulmonary Medicine as well as being a Fellow of the American College of Chest Physicians. He completed post-doctoral fellowships in molecular biology and cell biology at the Eleanor Roosevelt Cancer Institute and the Webb Waring Institute respectively.

**Christine Shapard, Executive Director, Colorado Cleantech Industry Association**

Christine (Chris) Shapard is the Founding Executive Director of the Colorado Cleantech Industry Association. In addition to her role with CCIA, Christine is also an ex-officio member of Governor John Hickenlooper's Venture Capital Investment Advisory Committee and she chairs the Colorado Department of Labor's Green Jobs Colorado Advisory Council (GJCAC).

**Dan Stinchcomb, CEO, Inviragen, Inc.**

Dr. Dan Stinchcomb is Chief Executive Officer and President of Inviragen, a biotechnology company focused on developing vaccines for infectious diseases worldwide. Inviragen's lead product is a dengue fever vaccine in Phase 1 clinical testing. Prior to founding Inviragen, Dr. Stinchcomb was Executive Vice President of Research and Development at Heska Corporation and held scientific management positions at Ribozyme Pharmaceuticals (now Sirna, acquired by Merck) and Synergen (acquired by Amgen). Formerly, Dr. Stinchcomb was an Assistant and Associate Professor of Cellular and Developmental Biology at Harvard University and he currently is an Adjunct Professor of Biochemistry and Molecular Biology at Colorado State University. Dr. Stinchcomb is an inventor on over 20 issued US patents and has authored more



than 30 scientific articles. He received his PhD degree in Biochemistry from Stanford University and his BA degree from Harvard.

Carol Sturman, *President and Chairman, Sturman Industries*

In 1989 Carol Sturman founded a research and development company specializing in the application of high tech digital controls technology in mechanical systems, based on the technology invented by Eddie Sturman, the technical leader of the company, who became a partner with Carol in Sturman Industries in 1990. In the first six years, Carol helped lead the company's business growth at a rate of approximately 100% annually. Sturman Industries, located in Woodland Park, Colorado, is a multi-million dollar company with 45 employees. The company enjoys successful relationships with major customers in the North America, Europe and Asia. Carol and Sturman Industries are recipients of many industry awards. Most notably, Ms. Sturman was nominated and announced as winner of the 2008 Society of Automotive Engineers prestigious J. Cordell Breed Award for women mobility leaders. The award was presented at the 2008 SAE World Congress, an annual event attended by tens of thousands of international participants, held in Detroit, Michigan.



Elaine Thorndike, *CEO, Colorado Association for Manufacturing and Technology*

Elaine Thorndike has over 20 years of experience working in information, communications, and manufacturing technologies. Her experience has given her a thorough understanding of the connection between technology commercialization, manufacturing, and economic development. Her previous positions have included the Colorado International Trade Office, Kalba Inc. and Digital Equipment Corporation. She is a member of Economic Development Council of Colorado and the Association for Manufacturing Excellence. In her role as CAMT's CEO, she is responsible for working with federal and state government, universities, and manufacturing companies to create positive economic impacts for Colorado communities. Her leadership has resulted in doubling the growth of the organization now located in five offices across Colorado. The economic impact reported from clients as a result of working with CAMT since 2005 is over \$300M. She holds a Certificate of Advanced Studies in Computer Science and Management from Harvard University and a B.A. in International Government and Economics from Wells College



Debra Wilcox, *Executive Vice President, Bye Energy, Inc.*

Debra Wilcox is the Executive Vice President for Bye Energy, Inc., a start-up company developing bio-fuels and an electric propulsion system for general aviation. Ms. Wilcox is an attorney with a background in business and commercial real estate transactions. She previously worked for the Colorado Legislative Council, currently serves on the Colorado Aeronautical Board overseeing Colorado's 76 airports and is the co-chair of the Citizens Advisory Committee for FasTracks. In 2009 she was selected to participate in the NREL Energy Executive Leadership Program. She has been a speaker at several conferences on bio-fuels and is currently serving on a panel for the National Academies looking at renewable jet fuel projects on airports. A native of Colorado and a Spanish speaker, Ms. Wilcox holds a Bachelors of Arts degree in English Education from the University of Northern Colorado and a Juris Doctor degree from the University of Denver College of Law.



APPENDIX 2
STAGES OF PRODUCT DEVELOPMENT AND GAPS

Commercialization

Stage	Research and Development	Precommercialization	Start-Up	Early-Stage	Growth
Source of Funding	Federal R&D Funding Federal R&D Grant Support Agency Stage 1 SBIR Grants	Within University: Grants (funded through state, fed govt, or industry) Non-university: Grants funded by public ad philanthropic support or SBIR I or SBIR 2	Angel Investors SBIR 2, SBIR 3	Early seed-stage venture capital Publicly supported investment funds	Venture funds Equity Commercial Debt Industry (strategic alliances, mergers, and acquisitions)
Amount Needed	Varies \$20-100K (aero)	\$50,000- \$500,000 (Bio) \$100-\$1,000,000 (aero)	Up to \$1 million (Bio) (Clean Energy) Up to \$2M (Aerospace)	\$1 -\$2 million (Bio) (Clean Energy) (Aerospace)	More than \$2 million (Bio) (Clean Energy) (Aerospace)
Length of Time	1 year (aero) 1-5 years (bio)	1 year (aero) 1-2 years (bio)	1-2 years (aero) 5 years (bio)	1-2 years (aero) 3-5 years (bio)	1-5 years (aero) 3-5 years (bio)
Gap Existing	Funding, connections	Funding, connections, mentor	Need business leadership, funding, Lab Space	Need increasing business leadership for strategy development & business functions, facilities, animal trials	Need scaling up resources (hiring, training, staffing for full business functions such as accounting, finance, etc., Regulatory Approval