



September 2, 2014

**Ken Lund, Executive Director**  
**Michelle Hadwiger, Director, Business Development,**  
**and Director, Colorado Innovation Network**  
**Colorado Office of Economic Development and International Trade**  
1625 Broadway, Suite 2700  
Denver, CO 80202

Re: Annual Report from the Colorado Energy Research Authority

On behalf of the Board of Directors of the Colorado Energy Research Authority, in accordance with Section 24-47.5-102(3), Colorado Revised Statutes, I respectfully submit this report regarding the activities of the Authority during calendar year 2013.

The principal statutory purpose of the Authority is to direct the allocation of State matching funds to support research proposals of the Colorado Energy Research Collaboratory, a research consortium consisting of the Colorado School of Mines, Colorado State University, the University of Colorado Boulder, and the National Renewable Energy Laboratory ("the Collaboratory"). I am pleased to report that 2013 was another successful year for the Authority and the Collaboratory, even though it was a year of transition.

### **A Record of Successful Investment of State Funding**

In 2006, the General Assembly appropriated \$2 Million per year for three fiscal years, ending in June, 2009. H.B. 06-1322. These State matching funds were appropriated to the Authority for allocation to the Collaboratory. The Collaboratory would then use these matching funds to attract and supplement funding from federal and other public and private sources.

Under Section 24-47.5-103, as originally enacted in 2006, the Authority was required to demonstrate by June, 2012 that at least \$6 Million in federal grants or contracts for renewable energy research in Colorado had been secured through the Collaboratory programs. In 2012, we reported that the General Assembly's commitment of \$6 Million for the benefit of the Collaboratory had attracted federal and industry funding in excess of \$37 Million, far beyond the \$6 Million baseline requirement. In 2013, we were pleased to report that, from 2007 through 2012, the Collaboratory had received federal and industry funding in the amount of \$50.3 Million.

Today, we are pleased to report that, from inception through 2013, the Collaboratory has received federal and industry funding in the amount of \$56.2 Million. This represents the actual amount of new funding attracted to the state on Collaboratory research projects supported by state cost share. This total includes no multiplier, so the actual economic impact of this research funding is much higher. Nor does this figure include the economic impact from the clean energy companies that have been created by the Collaboratory institutions or have been attracted to Colorado by the opportunity to work with the Collaboratory institutions.

In short, \$56.2 Million is a very conservative estimate of the positive economic impact of the Collaboratory over the past seven years. To attract these federal and industry funds, the Collaboratory expended \$6.25 Million of State matching funds through 2013. As a result, each dollar of state funding expended by the Collaboratory helped to attract nearly nine dollars in new research funding to Colorado.

The measurement of the Collaboratory's effective leveraging of State matching funds is a dynamic process. Much of the \$56.2 Million in research funding represents second, third and now fourth generations of research, funded by federal, industry and foundation sources. These later generations of research are included in the total only if the Principal Investigators personally confirm that the later research flowed directly from the first generation of research which was supported by State matching funds. It's important to note, however, that subsequent generations of research generally receive no additional matching funds.

As a result, Colorado continues to reap additional returns on the original investments of state matching funds. In the coming years, Colorado will continue to see even more economic benefits generated by the original \$6 Million appropriation. Similarly, the investment of the more recently approved state matching funds will lead to multiple generations of research and significant economic impact.

Subsequent to the General Assembly's 2006 appropriation of \$6 Million, former Governor Ritter directed \$2 Million to the Authority in 2010 (earned by and distributed to the Authority in 2011), to be used for the same purposes as defined by the General Assembly in 2006. Consistent with Governor Ritter's direction, the use of these funds will be reported in accordance with Section 24-47.5-103.

There is a wealth of detail regarding the operations of the Authority and the Collaboratory in the following pages and the appendices. Here, in summary, is a brief overview of the Collaboratory's performance from its launch in 2007 through 2013:

- **The Collaboratory centers' private members have contributed more than \$4.72 Million to support the centers' shared (non-exclusive) research.**
- **Private industry has funded or committed to fund more than \$11.04 Million in sponsored research by the Collaboratory centers and individual Collaboratory institutions.**
- **The federal government has funded or committed to fund more than \$40.44 Million in sponsored research by the Collaboratory institutions.**
- **To attract these private and federal funding commitments of more than \$56.2 Million, the Collaboratory expended \$6.254 Million in State matching funds.**
- **The Collaboratory has generated nearly nine dollars in private and federal funding for every dollar of State matching funds.**
- **The Collaboratory is helping to attract large and small employers to Colorado and to create home-grown businesses with strong roots in Colorado and growing employment rolls.**



The foresight of the General Assembly and Governor Owens in 2006, supported by Governor Ritter's 2010 commitment, and recently reinforced by the General Assembly's 2014 appropriation have been essential to the shared goal of establishing Colorado as a clean energy research leader. The commitment of state funds allows the Collaboratory to successfully attract private support for the Collaboratory's centers and to successfully compete for federal research funding.

In Appendix E to this report, I summarize the activities of the Collaboratory centers that have received state matching funds through the Authority. Each of these centers is managed by a leadership team that includes representatives from all four of the Collaboratory institutions, with one institution serving as the lead. In short, these centers – and their great success to date – exemplify true collaboration.

The leaders of these centers and the world class researchers at the four Collaboratory institutions are responsible for the success of the Collaboratory and for the scientific, technological and economic benefits flowing to the State of Colorado. On behalf of all seven of the Directors of the Colorado Energy Research Collaboratory, I offer our thanks and admiration to these outstanding researchers.

### **Doing More With Less – The Authority Management Philosophy**

The original \$6 Million appropriation was expended by the end of 2012, with very successful results, as documented above. When the recession of 2008 hit, many energy companies reduced their research budgets, and Collaboratory centers lost industry members. In response, the Collaboratory leadership restructured the model for distribution of matching funds, preparing for a long, slow evolution of the Collaboratory, instead of the early, explosive growth. The initial \$6 Million appropriation, expected to last three years, was carefully managed to last five years. Recognizing that the State's own budget had been stretched to the limit for the past several years, the Authority and Collaboratory worked to continue this record of success without seeking a new appropriation.

As noted above, in 2010, Governor Ritter created a one-time opportunity for the Authority and the Collaboratory to earn \$2 Million in State Fiscal Stabilization Funds, a federal funding source under the American Recovery and Reinvestment Act of 2009. Based on the Collaboratory's successful partnerships with private industry, the Collaboratory met the terms of this grant. These new funds were transferred to the Authority, for the benefit of the Collaboratory, in 2011.

To maximize the impact of the available funds, the Authority and Collaboratory leadership began in 2011 to gradually reduce the amount of matching funds available to the Collaboratory's established research centers (biofuels, solar and wind). Instead, the Collaboratory leadership began to increase the percentage of its remaining matching funds to be used to support collaborative proposals for federal research grants. The proposals selected to receive state funding support through the Collaboratory were those offering the best opportunity for substantial federal funding and scientific impact. Over the past seven years, federal grants have provided the best short term leverage of Collaboratory matching funds, generally providing at least \$4 for every \$1 of matching funds.

However, the shift in funding strategy took some time to find success. In 2013, as researchers shifted their emphasis from center-focused activities to federally funded research, the Collaboratory disbursed only \$249,000 in matching funds, the lowest annual total since inception. In return, however, these researchers received more than \$1.5 Million in federal funding.

This change in funding emphasis continues to show very positive, early results through the first eight months of 2014, with approximately \$750,000 in matching fund commitments helping to attract approximately \$8.5 Million in federal funding. Because those projects weren't funded and work did not begin until 2014, these funding successes are not included in the financial summaries of this 2013 report. I mention these 2014 activities, here, as evidence of the successful strategic pivot by the Authority and the Collaboratory's leaders and researchers.

### **State Funding Remains Essential to the Missions of the Authority and Collaboratory**

The 2014 appropriation of \$1 Million, with an additional \$1 Million identified for FY 2016, provides the Authority and Collaboratory with a level of baseline funding through 2015. The Authority and Collaboratory leaders will continue to search for alternative sources of funding and for cost-saving practices to stretch the remaining matching funds. The Authority and Collaboratory leaders agree, however, that in the long term, State matching funds are essential to attract federal and industry funding for the following reasons:

- Most federally funded energy research grants require some level of matching funds (usually 20% of the total project budget) as a precondition for application;
- Industry partners view state matching funds both as an indicator of state commitment and as a way to stretch their own research investments; and
- Other states are successfully using matching funds to attract industry partnerships to their own research institutions.

With full recognition that the State's funding has been essential to the Authority's and the Collaboratory's success, we are grateful for the continuing commitment of Colorado's elected leaders to the missions of the Authority and the Collaboratory.

### **Helping to Build Colorado's Economy**

H.B. 06-1322 recognized that the development and production of clean energy will advance the economic well-being of Colorado. Since the Collaboratory's launch in January, 2007, we have seen a substantial expansion in Colorado's clean energy research, development, production, and manufacturing capabilities. According to the Metro Denver Economic Development Corporation, the Metro Denver region now ranks as the sixth highest concentration of cleantech workers among the 50 largest metropolitan areas in the country, *with a growth rate of 22% since 2008.*



Metro Denver Energy Employment Snapshot U.S. data in ( )	Cleantech
Direct Employment	18,880
Companies	1,430
Five-Year Employment Growth (2008-2013)	22.1% (13.1%)
Direct Employment Concentration (2013)	1% (0.5%)
Employment Concentration Ranking (Among 50 largest metros)	6

Adapted from <http://www.metrodenver.org/industries/energy/>

Among the reasons cited by MDEDC for Colorado's strong standing as a national energy leader is the quality of and accessibility to our educational and research centers, including the four Collaboratory institutions. The Collaboratory helps to attract employers to Colorado by building an educational and research cluster that serves industry. By educating undergraduate and graduate students in science, engineering, business and other disciplines, the Collaboratory ensures that clean energy businesses and their suppliers can find the talent that will help them succeed.

The close partnership between NREL and the universities has also helped to attract world class researchers. Without this powerful partnership, many of these nationally recognized researchers would have been hired by our competitors in other states and countries. In short, clean energy R&D and manufacturing companies locate where the R&D community can support their needs, and Colorado's R&D community is recognized as a world leader.

**Proximity to energy-related higher education programs and research centers.**  
Colorado ranked 10th in the number of science and engineering graduate students per 1,000 individuals ages 25 to 34 years old in 2009. In addition, Colorado ranked 11th for research and development (R&D) expenditures per capita (\$242) among academic institutions in fiscal year 2011.  
*(National Science Foundation, 2013)*

The Collaboratory is playing a key role in creating and supporting homegrown companies and in attracting existing clean energy companies that are looking to relocate. These employers already represent thousands of jobs in Colorado. We are grateful that the Collaboratory's role in bringing businesses and jobs to Colorado has been acknowledged by State officials, by the Metro Denver Economic Development Corporation, and by other Colorado economic development agencies.

### **Protecting Colorado's Role as a Leader in Clean Energy Innovation**

The Collaboratory is a uniquely successful model of true collaboration. Our first generation of research has led to second, third and fourth generations, leveraging \$6M in state matching funding to attract more than **\$56 Million** in additional federal and industry funding for advanced energy research in Colorado. However, the continued success of the Collaboratory is not guaranteed. To survive, an R&D community needs a constant stream of new research ideas, supported by a combination of public and private funding.

From 2007 to 2012, the biofuels, solar, and wind sectors helped to grow and support Colorado's economy, and these sectors will continue to play a significant role in Colorado's economic growth. Looking forward, the Authority and Collaboratory leaders also see three other areas of energy innovation which will play increasingly large roles in federal funding and in Colorado research and economic growth: carbon management; energy management systems; and subsurface scientific exploration, leading to geothermal energy development.

These emerging energy sectors, along with biorefining, solar and wind, and the traditional energy sectors of oil and gas and, to a lesser extent, coal, will drive the creation of new technologies, new companies, and new jobs. The Collaboratory's reputation for research excellence has been and will continue to be a central factor in attracting and nurturing these companies.

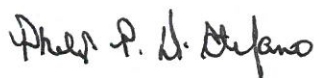
The Collaboratory's success and the impact of clean energy R&D as an economic driver have not been ignored by other states. Today, it's widely recognized that the states that succeed in establishing leadership in the still emerging clean energy sector will attract major national and international companies and investment. This success will bring research, manufacturing, construction, and financial jobs to those states for the next 25 years and beyond.

In 2007, when the Collaboratory was launched, it was one of very few clean energy research centers around the world. Today, many states are competing for leadership in clean energy research, development, and production. And a number of these states – California, Michigan and New York, for example – provide far higher levels of state support for their clean energy R&D community than Colorado has been able to.

Initially, the Collaboratory's research assets were so strong that the Collaboratory was able to successfully compete, even with lower levels of matching funds. More recently, the availability of higher state support elsewhere has lured away some of our industry partners. We don't need to match the highest levels of funding offered by some other states, but the Collaboratory must have a reliable source of State matching funds to compete on this new playing field.

The Directors of the Colorado Energy Research Authority are grateful for the past support of Colorado's Governors and the Colorado General Assembly, and we are proud that we have exceeded your and our expectations in the effective investment of these State funds. We look forward to continuing this productive relationship, and we will be pleased to respond to any questions you may have at this time or in the future.

Sincerely,



Philip P. DiStefano, Ph.D.  
Chancellor, University of Colorado Boulder  
Chair, Colorado Energy Research Authority



Copies:

Governor Hickenlooper  
Directors of the Colorado Energy Research Authority