

# **The Colorado Industrial Energy Challenge: Promoting Energy Efficiency at the Facility Level**

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## **ABSTRACT**

Colorado is one of 23 state and regional partnerships competitively selected by the U.S. Department of Energy in 2010 to receive an award to run a state industrial energy efficiency program. Colorado developed an innovative approach, based on considering the types of assistance and support that would be most successful in encouraging energy efficiency at Colorado's industrial facilities. The resulting program, the Colorado Industrial Energy Challenge (CIEC), is a voluntary state and business partnership that encourages Colorado industrial facilities to set a five-year energy efficiency goal and offers various types of assistance to help them meet the goals. The program includes several unique elements compared to other state industrial EE programs, including recognition from the Governor for energy efficiency achievements, and frequent opportunities for facilities to network and share best practices. Although similar to DOE's Save Energy Now Leaders program, the CIEC program focuses on the plant- or facility-level, and allows more flexibility in setting energy goals. Preliminary results show that the program is off to a good start, with potential for a significant impact over the next several years.

## **Development of the Program**

In March 2010, the Colorado Governor's Energy Office and a suite of partnering organizations including the Southwest Energy Efficiency Project (SWEET), Colorado State University's Industrial Assessment Center, and ETC Group, an energy consulting firm centered in Salt Lake City, together launched the Colorado Industrial Energy Challenge. The program is funded 50 percent by state funds and 50 percent by a grant from the U.S. Department of Energy's (DOE's) Industrial Technology Program (DOE 2010). The Governor's Energy Office wanted to develop an industrial energy efficiency (EE) program to help achieve the goals of the Colorado Climate Action plan, including a specific goal for greenhouse gas emissions reductions through industrial EE. The program's partners had the opportunity to design an industrial program structure from scratch, based on examples from other successful state and regional programs around the country, as well as several new program elements.

In a nutshell, the CIEC program invites large and medium-size industrial companies in Colorado to commit to a five-year energy efficiency goal and to report energy consumption data annually to measure progress towards the goal. In return, the program provides recognition from the Governor, free energy assessments and implementation assistance, and networking and training opportunities. The CIEC program is open to industrial companies that spend over \$200,000 per year in energy costs. Eligible sectors include manufacturing, oil and gas, mining operations, ski resorts (because of snow-making operations), R&D facilities, and municipal water and wastewater utilities.

Shortly after the award had been granted, the Department of Energy announced the Save Energy Now (SEN) Leaders program. We were surprised to note that many elements of the SEN

Leaders program were very similar to our grant proposal, and at first were concerned about program redundancy. The Colorado program and the SEN Leaders program both encourage goal-setting, offer recognition, and provide technical assistance. However, DOE encouraged us to proceed with recruiting Colorado facilities to participate in our state-level program, while also encouraging larger companies to consider joining the national program. The CIEC program differs and potentially complements the SEN Leaders program in two ways:

- Requirement for a 5-year, facility-level goal, with more flexibility
- A focus on facility-level energy management rather than corporate-level

There are several program aspects that distinguish our state-level effort from other state industrial efficiency programs:

- Recognition from the Governor in a public ceremony
- Peer-to-peer networking meetings
- State energy office commitment

## **Background on Colorado industry**

Compared to other states, Colorado is 23rd in industrial energy consumption, (see Figure 1 on p. 3). Colorado's most important industries in terms of revenue include aerospace, bioscience, information technology, renewable energy technologies, oil and gas production, mining, and natural resources (Colorado OEDIT 2011). The state has been gradually shifting over the past two decades from a dominance of traditional manufacturing and mining industries to a diverse, high-tech economic base. This shift has made Colorado industry more able to weather economic down-turns such as the recent recession of 2008-2009.

Despite the diversity of industries, the challenges of planning and implementing energy efficiency measures are similar from site to site, as are many of the largest energy-consuming systems (e.g., steam systems, process heating, compressed air, fans and pumps, etc.). Following the DOE's lead, most state industrial EE programs focus on these similarities and on the common industrial energy use systems.

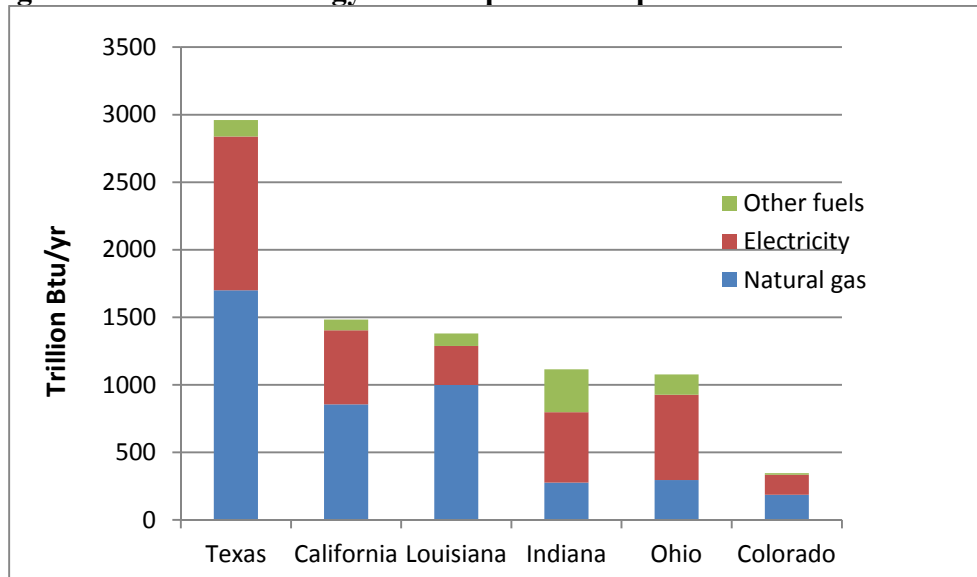
## **Program Elements Common to Other State Programs**

Many elements of the Colorado Industrial Energy Challenge are similar to program elements offered by other state programs and the SEN Leaders program. These include:

- Energy assessments
- Workshops on key energy-consuming systems and DOE software tools
- Training on energy management programs (continual improvement approach)
- Measurement and tracking of energy savings

Most of the 20 CIEC member companies have or will participate in an energy assessment offered through the program. These are a key element of the program, and this direct assistance to companies to identify and evaluate energy-saving opportunities is very useful. In addition

**Figure 1. Industrial Energy Consumption in Top Five States and Colorado**



Colorado has the 23rd-highest industrial energy consumption in the U.S., about 346 trillion Btu per year. “Other fuels” include coal and biomass. Data from U.S. Energy Information Administration (EIA).

about two-thirds of the companies have attended one of our sponsored workshops or energy management trainings. The workshops are also a key element in helping companies to find and implement new technologies and operating practices. These are common to most state programs, and they complement the more innovative elements of the Colorado program.

## Unique Colorado Program Elements

As mentioned above, compared to other state programs, the Colorado program has a few unique elements including Governor recognition, support from the state energy office, and quarterly networking meetings. And compared to the DOE’s Save Energy Now Leaders program, we have different requirements for energy goals, and focus more on facility- rather than corporate-level energy management.

## Public Recognition from the Governor

Colorado is fortunate that the previous Governor Bill Ritter, Jr. and current Governor John Hickenlooper understand and appreciate the importance of energy efficiency to industries’ profitability and to Colorado’s environment. Both Governors have played a key part in the growth of the Colorado Industrial Energy Challenge and the commitment of participating companies; by offering recognition in a public ceremony (see Figure 2 below).

Although several other states offer recognition as a component of their industrial program, we are unaware of others that have a public ceremony presided over by the state’s Governor.

According to participating companies, the Colorado Governor’s involvement has made a significant difference in boosting the profile of energy efficiency efforts within the company as

well as publicizing the company's efforts externally. Several companies stated that recognition from the Governor was a top reason for joining the program.

**Figure 2. First CIEC Recognition Event**



In July 2010, Colorado Governor Bill Ritter (right) presented a certificate of recognition to representatives of Amgen (left and middle) as well as to the other thirteen charter members of the Colorado Industrial Energy Challenge. The governor thanked the companies for their commitment to energy efficiency and encouraged further action. Having the Governor's support of the program has been crucial for gaining buy-in and participation.

Photo source: Colorado Industrial Energy Challenge

In this year's recognition ceremony, planned for July 2011, the seven companies that have joined the program since the first recognition ceremony will receive certificates. In addition the Governor will give awards to four companies with the most outstanding energy efficiency achievements over the past two years (2008-2010). Our goal is that in the next few years, this will contribute to competition between companies for EE awards, and to a greater importance assigned to energy efficiency within the companies.

### **Peer-to-Peer Networking Meetings**

Beginning in September 2010, the CIEC program has offered quarterly peer-to-peer networking meetings. These quarterly networking meetings were inspired by a similar effort by the Southeast Energy Efficiency Alliance, which has also found success with this approach (Marsh 2010).

The networking meetings have been well-attended, by facilities/energy managers and sometimes one to two others from each company. These meetings are held at a different member companies' site each time and typically consist of the following agenda:

- Introductions and program updates
- Presentations of best practices or recent EE projects implemented

- Open discussion of challenges and solutions
- Brief tour of host facility’s energy systems

Energy/facility managers value the opportunity to learn from their peers, and the success and popularity of our quarterly peer networking meetings have exceeded our expectations. In fact, they are the second-most-frequently-cited reason for joining and maintaining participation in the program, after the recognition component. Each quarterly networking meeting is attended by approximately two thirds of participating companies, despite the sometimes considerable geographic distance between the host site and attending companies.

Several successful projects have been shared so far at these meetings (see Table 1 below), which has been very popular with participants. “At our first networking meeting, just listening to Amgen’s energy manager talk about what they’re doing sparked an excitement with everyone in that conference room,” mentioned Jerry Becker at Woodward. (Becker 2011).

**Table 1. Example Best Practices Shared at Networking Meetings**

<b>Company</b>	<b>Type of Industry</b>	<b>Date of Networking Meeting</b>	<b>Summary of Best Practice Shared</b>
Amgen	Bio-pharmaceutical	March 2011	<p><b>HVAC system re-commissioning</b></p> <ul style="list-style-type: none"> <li>• Involved adjusting setpoints, reducing simultaneous heating and cooling, optimizing economizers, etc.</li> <li>• Resulted in annual energy savings of \$190,000, with implementation cost of only \$50,000.</li> </ul>
Avago Technologies	Semi-conductor chips	September 2010	<p><b>Heat recovery from chiller condensers to pre-heat process water</b></p> <ul style="list-style-type: none"> <li>• Recovered heat is used to pre-heat city water before being treated and purified for process use.</li> <li>• Resulted in annual energy savings of \$200,000, with an implementation cost of only \$14,000.</li> </ul>
MillerCoors Brewery	Brewery	December 2010	<p><b>Employee incentives for EE suggestions</b></p> <ul style="list-style-type: none"> <li>• Developed a training manual for other plant employees, explaining some of the main types of opportunities in key end-use areas.</li> <li>• Provides incentives to employees to find energy or other resource-saving ideas</li> </ul>

In addition to specific projects, companies also share successes on more general energy management elements such as developing energy teams or soliciting energy-saving ideas from all employees, or approaches to get energy projects financed. At the December 2010 networking meeting, MillerCoors Brewery discussed its energy teams and its training to employees to help them identify energy-saving opportunities. New Belgium also presented its approach to involving employees and encouraging new ideas.

According to Steve Wolley, Facility manager of Avago Technologies, “The discussion at the last networking meeting about compressed air systems was really helpful. It validated that we

are heading in the right direction. These types of discussions are where I see the main benefit of program” (Wolley 2011). Brad Fitzke of Hunter Douglas added, “It’s been helpful to talk with other companies about how they approach their management about energy. With the economy down, management is beginning to be interested in reducing energy costs, but they often don’t realize that you need to spend money to save money. The networking has helped with this.” (Fitzke 2011).

In addition it is difficult to capture all the side conversations that occur in which energy/facility managers discuss specific challenges with each other. When asked whether a recent meeting was useful, Jim Williams, Energy Manager at Amgen, stated, “On the tour, I took particular notice of how they control their free cooling system. We are hoping to implement free cooling at our Longmont plant, but face some obstacles.” (Williams 2011).

### **State Energy Office Commitment**

In forming and designing the Colorado Industrial Energy Challenge, the Colorado Governor’s Energy Office formed a team comprised of several existing public-sector and private-sector organizations with expertise in industrial efficiency, and offered a 50/50 cost-share match for the federal grant—far higher than in most other states. Prior to the launch of the Colorado Industrial Energy Challenge, the Colorado Governor’s Energy Office (GEO) had no programs directly related to industrial efficiency. As mentioned above, GEO wanted to develop programs in this area to help achieve the goals of the Colorado Climate Action Plan.

Having the financial support and direct involvement of GEO in the CIEC program is crucial in getting the governor to commit to the annual recognition events. In addition, through its regional representatives, GEO’s involvement has helped to promote a wider geographical representation in the CIEC program. GEO has also encouraged coordination with and involvement of Colorado’s utility programs.

### **Five-year Goal-Setting**

All facilities participating in the Colorado Industrial Energy Challenge are required to commit to a 5-year energy goal, within six months of joining the program (see Table 2). This differs from the national SEN Leaders program which requires a 10-year goal (discussed below), and differs from most other state programs that do not require a goal at all (DOE 2).

Requiring an energy savings goal helps focus attention on energy efficiency within each participating company, promotes a culture of change among the participants, and ultimately contributes to greater energy savings. In addition, since both the facilities manager and the plant manager have to sign our program’s “agreement letter” committing to a five-year goal, it strengthens the internal lines of communication about energy and promotes buy-in for the program at every management level.

Most of the companies in the Colorado Industrial Energy Challenge would not have an energy goal if not for their participation in the program. Even when plants have sustainability, environmental, or energy management goals or directives from their corporate headquarters, these don’t always translate to a local goal for a particular plant, or a plan of action. To make the goal-setting process easier, and to help make sure the goal is aggressive and challenging yet achievable, the Colorado Industrial Energy Challenge offers direct advisory assistance to each company in defining their goal metric and setting their goal level.

Initially we thought that some facilities would already have energy goals because of the corporation being involved in SEN Leaders or Climate Leaders. However, it turns out that all of the Colorado facilities in the CIEC program have set new goals for the CIEC program. For example, Roche, Frito-Lay, and MillerCoors were all involved in the EPA Climate Leaders program, but none of the Colorado facilities of these companies had specific energy efficiency goals as a result of that involvement.

The DOE Save Energy Now program asks its Save Energy Now Leaders to commit to a ten-year goal of reducing energy intensity by at least 2.5% per year. We adjusted our program's required goal period down to five years and are allowing additional flexibility in the goal level and type. We are asking for a minimum goal of 2% per year intensity improvement, but also allowing absolute reduction goals. Changing the goal length to five years was crucial in persuading many companies to join the program. Carestream, which makes x-ray photographic materials for the medical industry, was reluctant at first to commit to even a five-year goal, and there is very little chance it would have agreed to a ten-year goal (Merlino 2011). MillerCoors needed its Colorado goal to match up with its newly developing corporate goal, and thus would not have committed to a longer time-frame than five years (Cook 2011).

**Table 2. Example Goals of CIEC Member Companies**

Partner	Industry Type	Energy Goal
Amgen	Biopharmaceutical products	Reduce total energy consumption by 20% from 2007-2012
Aspen Skiing Company	Ski resort	Reduce total energy consumption by 10% from 2000-2012.
Avago Technologies	Semi-conductor devices	Reduce energy consumption per unit of production by 40% from 2008-2013
Carestream Health	X-ray photographic materials	Reduce total energy consumption by 12% from 2009-2014, based on estimated savings from projects compared to 2009 consumption
Crested Butte Mountain Resort	Ski resort	Reduce total energy consumption by 8% from 2008-2015
Hunter Douglas	Window coverings	Reduce energy consumption per production unit by 18% from 2008-2013
MillerCoors	Brewery	Reduce energy consumption per barrel of beer by 12% from 2010-2015.
Roche Colorado	Pharmaceutical products	Reduce total energy consumption by 10% from 2009-2014
Sandoz	Pharmaceutical products	Reduce energy consumption per unit of production by 15% from 2008-2014

Five of the CIEC members have adopted absolute energy reduction goals, and several goals are more aggressive than the minimum of two percent per year intensity improvement. CIEC members spend an average of \$6 million per year on energy.

The flexibility to go beyond a flat 2% or 2.5% intensity improvement per year is also important. For many companies such as those with high HVAC loads due to clean rooms (e.g., pharmaceutical companies), energy consumption does not vary significantly with production

levels, so absolute goals make more sense. Table 3 above lists the goals for CIEC members that are different than a 2 percent per year intensity improvement.

The process of setting a goal was itself useful to some of the participating companies. “Setting a goal helped us think through how we are going to achieve the goal,” mentioned Brad Fitzke of Hunter Douglas (Fitzke 2011). “You have to know where you’re going,” agreed Jeff Moore at Golden Aluminum. Moore added, “Setting a goal is very helpful in getting more buy-in from management. This can really help push projects through.”

Facility managers at several participating companies were able to gain additional upper management support for their goal by tying their goal-setting to the program’s recognition event. At Amgen, the energy manager of the Boulder and Longmont facilities and the Executive Director of Engineering both attended the program’s July 2010 recognition event, and this helped encourage Amgen Colorado to set an aggressive 5-year energy goal of 20% absolute reduction in energy consumption. The recognition event also helped build support for Woodward’s energy goal and overall energy management efforts. Jerry Becker of Woodward recently made a presentation on energy management at a company-wide quarterly meeting of mid-level managers, highlighting the Colorado facilities’ participation in the Colorado Industrial Energy Challenge. According to Becker, the other managers, including several vice presidents, showed much more interest in energy management than at any previous meetings. Jerry said that for the first time people were asking, “How can we do more?” (Becker 2011).

### **Facility-Manager Focus**

The national SEN Leaders program is aimed at chief executive officers and other top management at national corporations. As shown in previous studies, effective and sustaining energy management programs require strong CEO and other top management commitment to ensure that energy efficiency is part of a company’s core culture and operations. CEOs and upper management are often responsible for approving and communicating sustainability goals, ensuring sufficient financial and personnel resources to achieve those targets, and tying successes to a company’s external image (Prindle 2010).

However, whether or not a top-down commitment exists, the actual implementation of energy efficiency often falls to facilities managers and other personnel at the individual plant level. The Colorado Industrial Energy Challenge primarily interacts with these facilities managers and personnel.

One focus of the program’s energy management training is to encourage the formation of an energy team at each plant. We emphasize that this team should not consist exclusively of the facilities manager and related staff that are already working on energy efficiency projects but should include participants from multiple departments across the company, including financing, engineering, marketing, packaging, and others. Employees from other business units often are aware of other energy-savings opportunities that hadn’t yet been brought to the attention of the facilities group, or hadn’t yet been properly analyzed for energy- and money-savings potential. Some companies’ energy teams have one or more rotating spots on the energy team where people from different department can join for 2-3 months, contribute ideas and prioritizations, and then trade the spot to a new person. (Dantoin 2011).

Our focus on the individual plant level helps fill in educational, technical, networking, and implementation gaps that could otherwise be missing from a national program that interacts with corporate-level upper management.



## Preliminary Results

The Colorado Industrial Energy Challenge is now just about to enter its second year, with 20 participating Colorado companies/facilities. To track progress towards the companies' goals and to measure overall achievements of the program, we ask companies to provide annual energy consumption data (for the previous calendar year) in March or April of each year. Table 3 summarizes overall achievements from 2009-2010 for sixteen companies. In addition, at least twice a year we ask companies for information on projects being evaluated or implemented.

**Table 3. First Year Preliminary Energy Savings by Member Companies**

Total Energy Consumption in 2009 (MMBtu)	Energy Savings from 2009-2010 (MMBtu)	Percentage of Energy Savings
10,720,100	270,300	2.5%

Sixteen of twenty CIEC member companies provided energy consumption and intensity data for 2009-2010. For this one-year period, the 16 companies achieved overall energy savings, including avoided consumption through intensity improvements, of 2.5%. Although not shown here, the annual savings for individual companies ranged from 18% to an increased consumption of 5%.

Although the program cannot take direct credit for these accomplishments, we believe that through participation in the program, many companies are increasing their level of effort towards energy efficiency. Companies are learning from each other through the quarterly networking efforts, and reinforcing the level of importance being applied to energy efficiency. In addition the technical assistance through energy assessments and workshops will also contribute to measurable results in the next year.

Even more important than one-off energy-efficiency projects, the companies participating in the Colorado program are developing continual improvement approaches towards their energy management programs. The quarterly networking meetings reinforce this type of approach, and the annual recognition events help build upper-management recognition of energy's importance within each company.

## Company Perspectives on the Program's Value

We have found through surveys and personal communication that each company's participation in the Colorado Industrial Challenge, its reasons for joining, and the value it perceives are different for each company—and sometimes different for various people within a company. However, many companies value the Governor recognition, the networking opportunities, and the free technical assistance offered. Table 4 illustrates some participating companies' reasons for joining.

**Table 4. Sample Reasons for Joining the Program**

<b>Partner</b>	<b>Stated Reason for Joining CIEC</b>
Woodward	“It’s a good opportunity to get some visual promotion of what our programs are doing internally. Second, it involves a commitment on Woodward’s part; instead of just intending to do something, we’ve signed on dotted line” (Becker 2011)
Carestream	“We joined the program because first off we’re interested in reducing our energy load and energy costs. The environmental impact was also compelling. Joining forces with CIEC make sense because we can tap into some of the program’s resources to drive down costs” (Merlino, 2011)
Amgen	“We want to change the perception of the company as using a lot of energy. This year, Amgen will be publicly releasing its sustainability goals and achievements. Joining this program puts our Colorado facilities in line with those” (Williams 2011)
Golden Aluminum	“This program is a way to see what other industries are doing to conserve resources, and give us ideas that we can use. Also, we appreciate getting a little recognition for our efforts. Our customers are increasingly pushing sustainability; this program helps us demonstrate our efforts in that regard” (Fitzke 2011)
Rocky Mountain Metal Container	“We want to show leadership in energy and environmental management, and to gain recognition for that. This program will also help us to drive more awareness of energy efforts within company” (Kress 2011)
New Belgium Brewery	“CIEC inspired us to set a compelling goal, and we wanted to join with the community of Colorado industries in asserting the importance of energy-use reduction” (Orgolini 2010)

## **Persistent Challenges**

Despite the positive gains made in the first year of the Colorado Industrial Energy Challenge, the plants participating in the Colorado Industrial Energy Challenge continue to face both internal and external obstacles preventing faster and more significant achievements. These obstacles are not likely to diminish significantly in the next few years.

As with other U.S. industrial facilities, getting capital to finance new energy efficiency projects is one of the biggest obstacles. According to Rick Merlino, Site Infrastructure Manager of Carestream Health. “It takes capital to make many of the efficiency improvements we’d like to do, and in today’s environment, the company has to make trade-offs for how to best use its capital” (Merlino 2011). Facility managers at companies participating in the Colorado Industrial Energy Challenge report in conversations with us that their payback requirements for energy efficiency projects range from one to five years, with two years being most common. “In today’s marketplace, with the economy still coming out of recovery, the return on investment is very important. No one can afford to put money out there and not get it back for 10 years,” explained Jerry Becker, Facility Manager for Woodward (Becker 2011). “New product introduction would never hit a two-year hurdle rate. Energy projects are not valued as highly as other projects,” notes Steve Wolley, Facility Manager for Avago Technologies (Wolley 2011).

Finding staff resources to evaluate, test, and install new energy efficiency projects are also serious obstacles for many facilities. Other barriers also play their part in keeping worthwhile projects from going ahead. For many companies, new ideas are often met with resistance to change, ranging from new operating practices to process changes or new

technologies. “Energy efficiency requires a change of habit, both from industrial employees and from engineers designing equipment. They’re not thinking about the cost of compressed air, for example, but they should,” explains Brad Fitzke, Process Maintenance Manager for Hunter Douglas (Fitzke 2011). Jeff Moore, Engineering Manager for Golden Aluminum, agreed, adding “People think, ‘this is the way we’ve always done it,’ but they don’t see the costs. We need to make the energy costs more visible” (Moore 2011).

## Moving Forward

The Colorado Industrial Energy Challenge has had a successful launch year and has a promising program design, as evidenced by its 20 participating industrial facilities and the energy savings these plants have achieved in year one. Based on interviews with our member companies, most participants are enthusiastic about working with us and with each other to achieve additional energy savings in the years ahead.

There are challenges to overcome in terms of staff and financial resources, but we are optimistic about the program’s potential in the next several years. Through collaboration with the Department of Energy and other state industrial programs, we look forward to refining the program to make it as successful as possible, and to helping our participating companies develop self-sustaining energy management programs.

## References

Becker, Jerry (Woodward). 2011. Personal Communication. March 14.

[Colorado OEDIT] Colorado Office of Economic Development and International Trade. 2011. [www.colorado.gov/cs/Satellite/OEDIT/OEDIT/1162927366334](http://www.colorado.gov/cs/Satellite/OEDIT/OEDIT/1162927366334), Denver, Colo: Colorado Office of Economic Development and International Trade.

Cook, Matt (MillerCoors Brewery). 2010. Personal communication. November 23.

Dantoin, Timothy. 2011. *Practical Energy Management: A Path to Continual Improvement*. Boulder, Colo: Colorado Industrial Energy Challenge Practical Energy Management Workshop.

[DOE] U.S. Department of Energy. State and Regional Project Awards. 2010. [www1.eere.energy.gov/industry/states/state\\_portfolio.html](http://www1.eere.energy.gov/industry/states/state_portfolio.html). Washington DC: U.S. Department of Energy.

[DOE 2] U.S. Department of Energy. 2011. *All-States Summit*. Golden, Colo: U.S. Department of Energy.

[EIA] Energy Information Administration. State Energy Data System, 2008. Washington D.C. [http://www.eia.doe.gov/states/hf.jsp?incfile=sep\\_sum/plain\\_html/sum\\_btu\\_ind.html](http://www.eia.doe.gov/states/hf.jsp?incfile=sep_sum/plain_html/sum_btu_ind.html). We excluded consumption of petroleum products from industrial consumption totals because most industrial petroleum consumption is for feedstocks rather than fuel usage.

Fitzke, Brad (Hunter Douglas). 2011. Personal Communication. March 4.

Kress, Veronica (Rocky Mountain Metal Container). 2011. Personal communication. March 15.

Marsh, Rick (Southeast Energy Efficiency Alliance). 2010. Personal communication. May 18, 2010.

Merlino, Rick (Carestream Health). 2011. Personal communication. March 1.

Moore, Jeff (Golden Aluminum). 2011. Personal communication. March 11.

Orgolini, Jenn (New Belgium Brewery). 2010. Personal communication. July 7.

Prindle, William R. (ICF International). 2010. *From Shop Floor to Top Floor: Best Business Practices in Energy Efficiency*. Washington DC: PEW Center on Global Climate Change.

Williams, Jim (Amgen, Inc). 2011. Personal communication. February 1, 2011 and May 2, 2011.

Wolley, Steve (Avago Technologies). 2011. Personal Communication. March 18.