

# **Growing the Commissioning Industry in California: A Collaborative Effort**

*Grant Duhon, Pacific Gas & Electric Company  
Phil Welker, Amanda Potter, and Emily Moore, Portland Energy Conservation, Inc.*

## **ABSTRACT**

Brought together by a shared interest in advancing building commissioning practices in California, a diverse group of industry professionals joined together in 2000 and formed the California Commissioning Collaborative (CCC). Since its inception, the CCC has worked to transform the commissioning market in California by promoting commissioning education, training, and standards. The CCC is guided by a Board of Directors and Advisory Council comprised of government, utility and building services professionals, all committed to improving building performance and commissioning practices in California. This diverse group has afforded valuable support and direction to the CCC, resulting in many important projects, including:

- *Commissioning Case Study Database* – The CCC developed an on-line database of commissioning projects, which will be used to conduct cost-benefit analyses on selected projects;
- *Commissioning Outreach* – The CCC hosts a website for disseminating commissioning information, and now manages an on-line library, news briefs, and quarterly E-newsletter; and
- *Training Strategy* – The CCC is researching training needs of building owners, commissioning providers and contractors, and will develop a commissioning training strategy for California.

Indeed, in its first few years, the CCC has made great progress and earned a reputation as an important player in the California commissioning industry. Now, to further its goals and better facilitate its administration and funding contracts, the organization is gaining 501(c)(3) status. This paper highlights the CCC's role in developing California's commissioning industry, shares tactics the CCC has developed to transform the commissioning market, and provides an overview of current and future projects.

## **Background**

Building commissioning is increasingly recognized as a cost-effective process to improve building performance, reduce energy use, and improve indoor air quality, occupant comfort and productivity. Over the past ten years, support for building commissioning has grown in California and across the United States, and this support has led to significant building improvements and energy savings. Still however, a vast majority of buildings have not undergone commissioning, or an operational quality assurance process, and are therefore likely performing well below their potential.

The concept of forming a collaborative organization to help drive the market for building commissioning in California was first discussed at the 2000 ACEEE Summer Study on Energy Efficiency in Buildings. Recognizing that there were several disjointed efforts to promote commissioning activities in California, the group assembled to facilitate communication and information sharing among the various groups.

The first “official” meeting took place in October 2000. At the table were representatives from a wide range of organizations, including: the California Energy Commission, multiple utilities, private commissioning firms, research organizations, and various governmental entities. It quickly became clear that there was strong interest in establishing a forum and working cooperatively to educate building owners and policymakers about commissioning and promote its value as a viable energy savings strategy in California. At this time, the California Commissioning Collaborative (CCC) was formed.

## CCC Structure

The members of the CCC are directly engaged in a wide variety of commissioning activities, ranging from hands-on commissioning of buildings in California and developing commissioning-related tools and educational materials, to conducting research on specific commissioning issues, offering incentives to promote commissioning, and investigating opportunities for incorporating commissioning into building codes. Due to the diversity of its members, the driving principle behind the Collaborative is that these activities all hold greater potential if they are leveraged through a common vision. The mission of the CCC encompasses:

- Developing and promoting viable commissioning practices in California;
- Facilitating the development of cost-effective programs, tools, techniques, and delivery service infrastructure;
- Providing a forum for collaboration and communication; and
- Providing leadership and promoting integrity in the commissioning industry.

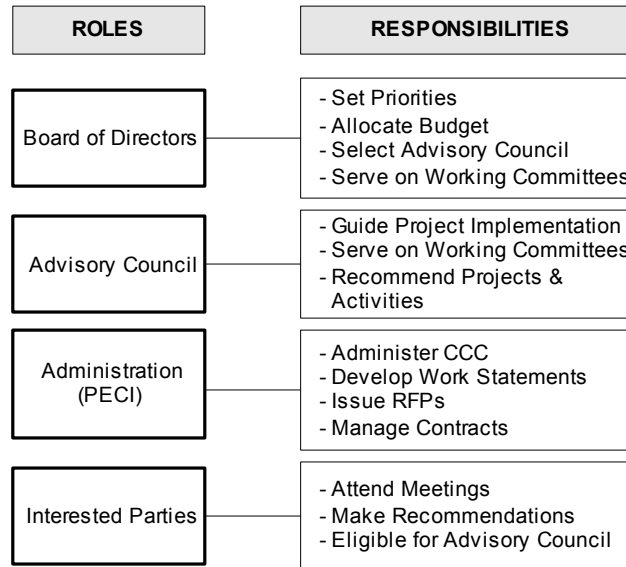
The CCC is guided by a Board of Directors whose primary responsibility is to set priorities for the organization and allocate the annual budget (approximately \$250,000). The Board of Directors is comprised of designated representatives from the various organizations that fund CCC activities and projects, shown in Table 1.

**Table 1. Current CCC Funding Stakeholders**

<b>Stakeholders</b>
California Division of the State Architect
California Energy Commission
Pacific Gas & Electric Company (PG&E)
Public Interest Energy Research (PIER)
Sacramento Municipal Utility District (SMUD)
San Diego Gas & Electric (SDG&E)
Southern California Edison (SCE)
Southern California Gas (SoCal Gas)
U.S. Department of Energy/ Federal Energy Management Program

The Board has appointed an Advisory Council to provide technical expertise, guide project implementation, and make recommendations on new projects. To administer the work of the CCC, including coordinating and facilitating meetings and managing project contracts, CCC has contracted with Portland Energy Conservation, Inc. (PECI). Many other interested parties are involved, and regularly attend CCC meetings and make recommendations to the Board and Advisory Council. Figure 1 further illustrates the various roles and responsibilities of parties within the CCC. Currently, there are nine Board members, 15 Advisory Council members, and over 100 interested parties.

**Figure 1. CCC Roles and Responsibilities**



In 2004, the CCC became an incorporated entity and will obtain Federal and California State 501(c)(3) status (pending at the time of publish). Incorporation and non-profit status were sought to validate the activities of the organization and help to leverage and facilitate the funding of future projects.

### CCC Priorities

At the time of the formation of the CCC, there were already many indicators showing the growth and potential of the commissioning industry, including: a growing number of large architectural and engineering firms entering the commissioning market; a steadily increasing number of participants at the National Conference on Building Commissioning (from 135 participants in 1993 to 326 in 1999);<sup>1</sup> incorporation of commissioning-related capabilities into major manufacturers' HVAC models; and new consideration by several states, including California, to legislate commissioning requirements (PECI, 2000).

The CCC was formed at an important time in the industry's development and the organization strategically set out to support and catalyze this new period of market

<sup>1</sup> Nearly 400 attended the National Conference on Building Commissioning in 2003.

transformation. While the market for commissioning continues to grow, there are a number of barriers for commissioning that are well known and documented.<sup>2</sup> Among the primary market barriers are:

- Lack of industry-wide education on what commissioning and retrocommissioning entails and the resulting energy and non-energy benefits;
- Need for better tools for diagnostics and analysis for both owners and providers; and
- Need for methods for ensuring a quality infrastructure for commissioning service delivery. (PECI, 2000)

To directly address the market barriers, CCC members worked to develop new tactics to transform the commissioning market and make commissioning business-as-usual in California. To do this, the CCC created an organizational Strategic Plan that includes the following five priorities:

- Improve market perceptions of commissioning;
- Address the economic drivers for commissioning;
- Target commissioning for specific market segments;
- Strengthen California's commissioning infrastructure of commissioning providers; and
- Expand market intelligence for the commissioning industry.

These priorities signify tremendous potential, and of course also present new challenges, as they require long-term, statewide commissioning market transformation. To be effective, the CCC Board of Directors and Advisory Council developed goals, strategies, and actions for each priority that are aimed to achieve long-term growth and stability in the industry. Each priority is discussed in further detail below.

### **Improve Market Perceptions of Commissioning**

Central to enhancing the market for commissioning services is raising general awareness about the commissioning process and its benefits. To support commissioning education, CCC Board and Advisory Council members see importance in convincing building owners and facility managers of the value of commissioning, clearly differentiating between commissioning and construction management, and helping to standardize industry practices to guide commissioning providers and reduce owners' skepticism.

To do this, the CCC will support curriculum development and class offerings for all market players; fund commissioning demonstration projects and develop case studies; use the CCC website as an educational and marketing tool; institute an annual Statewide Commissioning Conference in 2005; and initiate an awards program to recognize superior commissioning accomplishments in California.

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<sup>2</sup> A 2000 PG&E "California Commissioning Market Characterization Study" identified the need to educate owners and the need to develop case studies demonstrating the benefits of commissioning and retrocommissioning as the foremost issues impacting the progress of the commissioning industry. The PG&E study predicted, "Once owners understand the benefits and are confident and sophisticated buyers of the service, the requests for commissioning will increase and the industry will mature in a quality manner." (PECI, 2000)

## **Address the Economic Drivers for Commissioning**

To effectively make the case for commissioning, real world cost-benefit data is necessary. This will require standard metrics for conveying commissioning's energy and non-energy benefits, as well as consistent documentation methods to measure persistence of commissioning benefits over time. Without it, building owners and utilities cannot accurately evaluate commissioning costs in relation to savings.

To resolve this shortcoming, the CCC aims to: gather and analyze commissioning project cost-benefit data by market sector; develop financial analysis tools to improve building owners' ability to evaluate the cost-benefits of commissioning; document the persistence of commissioning's benefits; support commissioning in utility energy efficiency incentive programs; and advance the development of industry codes and standards.

## **Target Commissioning for Specific Market Segments**

There are a variety of approaches to the commissioning process, leading to confusion among owners about what to expect. Indeed, among the challenges in the commissioning industry are that each building type demands a unique approach, and, within market segments, there is little integration between standard building practices and commissioning.

To address these challenges, the CCC has prioritized the need to survey target markets to determine their interest in and need for commissioning, and research the scope of commissioning services required by various markets. In addition, the CCC aims to review typical commissioning processes (including sample RFPs and RFQs, commissioning specifications, and contract language) and develop a Commissioning Best Practices Manual for each market sector. Lastly, the CCC will work with a leader from each market sector in integrating commissioning into their construction and operating processes.

## **Strengthen California's Commissioning Infrastructure**

The commissioning infrastructure in California suffers from several deficiencies. It lacks education and training opportunities, general awareness of the opportunities that are available, and standards by which providers and the process can be measured. As a result, California lacks trained commissioning service providers and those in practice experience resistance from design and construction professionals in integrating commissioning into standard building practices.

Building the infrastructure for an emergent industry is a daunting task and the CCC has identified a few key steps in laying the foundation: (1) Conduct surveys of commissioning providers, building owners, and building contractors to determine training needs in the industry; (2) develop and disseminate training for commissioning service providers, organized by skill level and building market segment; (3) evaluate and endorse qualifications for commissioning providers; and (4) encourage the development of industry-wide tools to assist owners and commissioning providers in the commissioning process.

## **Expand Market Intelligence for the Commissioning Industry**

A primary challenge in the commissioning industry is tailoring commissioning processes for the various building market sectors. The industry also lacks baseline information about the buildings market that can contribute to the development of strategies to improve marketing efforts to building owners.

To overcome this barrier, the CCC will set out to: research and document the market baseline for the scope of commissioning projects; develop a commercial buildings market model based on building characteristics, energy use and ownership type; conduct market studies to map the trends in commercial building commissioning and the market for commissioning services, and identify tactical targets.

## **Current CCC Projects**

The five strategic priorities encompass a wide range of activities and set aggressive goals for the near-term and long-term. Together, the priorities seek to achieve long-term, commissioning market transformation in California. In meeting the objectives of the CCC, there are many previous efforts to draw upon and numerous projects that are currently underway. Three CCC-funded projects that are in progress and near completion are described below.

### **Commissioning Case Study Database**

To better articulate commissioning costs and benefits, the CCC funded the development of an on-line database of commissioning projects. The goal of the database is to collect standardized information about the scopes, costs, benefits, and findings of commissioning projects, and use the data to develop case studies and conduct cost-benefit analyses.<sup>3</sup> The database is designed to benefit both building owners and commissioning providers undertaking commissioning projects, as it will help to estimate potential costs and benefits for comparable buildings. The CCC will select buildings from the database and publish detailed case studies.

Also, once the database is sufficiently populated, the data will be analyzed across all buildings, providing useful commissioning cost-effectiveness metrics to owners and to regulators interested in pursuing commissioning as an energy savings measure.

### **Commissioning Outreach**

To help increase awareness about commissioning, the CCC hosts a website<sup>4</sup> for disseminating commissioning information, and has developed an on-line library of commissioning-related research and guidelines<sup>5</sup>, a news briefs website for the industry<sup>6</sup>, and a quarterly email newsletter. All were launched in January 2004. The on-line commissioning

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<sup>3</sup> Please refer to the 2004 ACEEE Summer Study paper, "Creating California's Online Commissioning Case Study Database: Case Studies Go High Tech" by Hannah Friedman and Tudi Haasl (Portland Energy Conservation, Inc.) and Ken Gillespie (Pacific Gas & Electric Company). This paper provides detailed information on quantifying the costs and benefits.

<sup>4</sup> [www.cacx.org](http://www.cacx.org)

<sup>5</sup> [www.cacx.org/library](http://www.cacx.org/library)

<sup>6</sup> [www.cacx.org/news](http://www.cacx.org/news)

library currently houses over 275 articles, papers, guides, and sample commissioning documents, and covers a wide variety of commissioning topics and research areas, including:

- Fault detection & diagnostic tools;
- Data collection & analysis methods;
- Commissioning for various equipment & controls;
- Persistence of commissioning benefits;
- Cost-benefit research for new and existing building commissioning;
- Case studies on office buildings, public projects, schools, labs, and LEED<sup>TM</sup>-certified buildings;
- Commissioning process management tools; and
- Industry information and market research.

The news briefs website includes links to news clips from the commissioning industry, as well as new resources, trainings and events, and current projects and research. The quarterly E-newsletter provides brief industry announcements and “hot” links to the news briefs website for the latest industry news and events. The newsletter is currently distributed to over 150 people, a list that is rapidly growing.

The CCC Outreach Project also includes an “information exchange” with the California Public Interest Energy Research (PIER) Buildings End-use Energy Efficiency Program (Buildings Program). The purpose of the information exchange is to further publicize the commissioning-related research being conducted through PIER and to help direct new research efforts to products that will be most useful in the growing commissioning industry. The PIER Buildings Program is a major supporter of commissioning research; in the last six years, the program directed over five million dollars towards building commissioning and diagnostics research, and partnered with numerous RD&D organizations, including individuals, businesses, utilities and public or private research institutions<sup>7</sup>.

Under the same project contract, the CCC is supporting the development of the equipment acceptance requirements that will be included in the 2005 Nonresidential Building Energy Efficiency Standards (also known as Title-24). These acceptance requirements are the state of California’s first step towards mandating building commissioning for newly-constructed buildings. The CCC is funding work to develop sample checklists and test procedures to support the new acceptance testing requirements, develop a test plan for field testing the procedures, and carry out the field testing of the procedures with contractors in California. This process will help to refine the Title-24 requirements and help to ensure the procedures are reasonable for contractors and commissioning providers implementing the tests in the field.

## **Training Strategy**

To help build the commissioning infrastructure, the CCC is currently supporting a research project to develop a Commissioning Training Strategy for the state of California. The project entails identifying existing commissioning training programs, surveying building owners,

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<sup>7</sup> Detailed information about PIER’s commissioning-related research projects can be found on the Buildings End-use Energy Efficiency Program website: <http://www.energy.ca.gov/pier/buildings/>.

commissioning providers, and building contractors about their training needs, and identifying new training opportunities. Based on information gathered from the surveys, market research, and input from CCC members, a California Commissioning Training Strategy will be developed to provide recommendations on training programs and curriculum for various audiences and levels of training.

These three projects began in 2003 and will be completed in 2004. Table 2 below shows the approximate budget for each.

**Table 2. Current Project Funding**

<b>Project</b>	<b>Budget</b>
Commissioning Case Study Database	\$27,000
Commissioning Outreach	\$195,000
Training Strategy	\$14,000
<b>Total</b>	<b>\$236,000</b>

## **Future Projects**

The following projects have been identified as the next priorities for the CCC, as they each help to fulfill the goals and actions set forth by the CCC Strategic Plan.

### **Develop Case Studies**

The CCC will continue to prioritize the development of commissioning case studies, as up-to-date, real world data on projects is essential to making the case for commissioning. Several projects have already been completed in California; however, the data has not been collected in a uniform format, nor reported consistently. In this project, the CCC will develop a standard case study format (2-4 pages in length), select commissioning projects from the Commissioning Case Study Database, and publish standardized case studies on these projects. At a minimum, four marketing case studies will be developed (two new building and two existing building commissioning projects), and disseminated to building owners.

### **Revise, Populate, and Analyze the Commissioning Case Study Database**

As previously mentioned, the Commissioning Case Study Database is a very valuable industry tool for analyzing and demonstrating the costs and benefits of commissioning. As a work in progress, additional efforts will be needed to ensure that the database is sufficiently populated and the cost-benefit analyses run smoothly.

To populate the database, there are various commissioning programs in California that are underway or in development that will yield an increasing number of commissioned buildings. These programs include:

- Pacific Gas & Electric and Southern California Edison Building Tune-Up Programs (Quantum Consulting, Inc.)
- San Diego Gas & Electric Retrocommissioning Program (PECI)

- Pacific Gas & Electric, Southern California Edison, San Diego Gas & Electric, and Southern California Gas – California High Performance Schools (CHPS) Projects
- Los Angeles County’s Retrocommissioning Program
- University of California/California State University Retrocommissioning Program

The CCC hopes to gain support from these programs in regularly inputting commissioning projects into the database.

As more projects are inputted, the need for new functions and capabilities will become increasingly apparent. The CCC will continue to revise the database, as necessary, to ensure that the data inputting process is user-friendly, and that practical queries and analyses are set up appropriately. As an example, the CCC has acknowledged the need for query capabilities that allow the user to analyze data by the following information:

- Types of buildings commissioned;
- Scope of commissioning undertaken;
- Types of problems most often found;
- Quantified benefits based on building size and type; and
- Cost savings based on building size and type.

These are among the numerous datasets that will be useful in tracking real world commissioning data, and ultimately presenting a stronger case for commissioning to building owners. Once sufficient projects have been inputted into the database, the CCC will complete a comprehensive cost-benefit study of the projects and complete an industry report.

### **Persistence Study**

The value of new and existing building commissioning is highly dependent on the persistence of the energy and non-energy benefits of commissioning; yet this aspect of commissioning is not very well understood. The CCC plans to address this deficiency and develop an analytical framework for studying the persistence of commissioning benefits. This framework will outline the data that needs to be collected in order to determine: how to systematically document commissioning benefits; how the Commissioning Case Study Database will be used to collect this data; and how the data will be analyzed to assess whether commissioning has persisted.

Once the Commissioning Case Study Database is sufficiently populated, the CCC will use the new analytical framework to study persistence of commissioning benefits and recommend strategies for improving persistence in the marketplace. The results of this part of the study will include:

- The buildings used, how they were chosen, and how they did or did not reflect the total building population;
- Evaluation of whole building energy use over time for each building, including an analysis of the reasons for changes in energy use over time;

- Evaluation of which systems and commissioning fixes have higher persistence, which have lower persistence, and why; and
- Evaluation of how the commissioning process affected the persistence of commissioning.

### **Retrocommissioning Screening Tool**

Building owners in California need guidance on which of their buildings are the best candidates for retrocommissioning. In an effort to address this need, the CCC will study existing building screening tools in the marketplace and develop a standardized tool for the industry. The CCC Advisory Council will discuss whether this tool should be expanded to guide owners on how to address all of their existing buildings.

Several building screening tools have already been developed in California and throughout the country. These tools have been used to help owners target the best candidates for energy efficiency retrofits, retrocommissioning studies, and building tune-ups. Below is sampling of some of these diverse tools:

- Northwest Energy Efficiency Alliance Building Performance Services screening tool;
- Pacific Gas & Electric building screening tool for schools;
- PIER building tune-up screening tool (developed by Quantum);
- University of Wisconsin’s audit process;
- ESCO industry benchmarking tools; and
- Pacific Gas & Electric CustomNet.

As part of this project, the CCC will evaluate the existing building screening tools and, for each tool, summarize the target building sector, the primary applications and energy efficiency opportunities identified by the tool, and the strengths and weaknesses of each. The CCC will then draw from the “best” characteristics of all the building screening tools and develop a standardized building screening tool for retrocommissioning in California.

These four projects will begin in 2004 and likely continue into 2005. Table 3 below shows the projected budget for each project.

**Table 3. Future Project Funding**

<b>Project</b>	<b>Budget</b>
Develop Case Studies	\$20,000
Revise/Populate/Analyze Commissioning Case Study Database	\$55,000
Persistence Study	\$70,000
Retrocommissioning Screening Tool	\$9,000
<b>Total</b>	<b>\$154,000</b>

### **Conclusion**

The CCC provides a unique forum for the building commissioning industry to explore new practices, tools and techniques, engage stakeholders and interested parties, and advance the industry through education and information sharing. The strength of the CCC is in its diversity of members, and resultant diversity of perspectives, skills, and experiences. Like no other entity

in the industry, the CCC builds upon a shared vision and commitment to leveraging new, cutting edge projects and transforming the California market for commissioning services. The CCC provides a model for other states wishing to strategically and systematically work to promote, develop, and implement building commissioning practices.

## **References**

Friedman, Hannah, Tudi Haas, and Ken Gillespie. 2004. "Creating California's Online Commissioning Case Study Database: Case Studies Go High Tech". *Proceedings of the 2004 ACEEE Summer Study on Energy Efficiency in Buildings*. Washington, DC: ACEEE.

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