Advanced Circuit Rider (Technical Assistance) Programs to Enhance Deployment of New Energy Efficient Technologies

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ABSTRACT

In recent years, many new, energy efficient technologies have been developed and promoted. For these technologies, training and support efforts are needed to achieve programmatic and market transformation successes.

This paper describes experiences implementing new, more aggressive approaches to enhance adoption of energy efficiency techniques and systems using "circuit riders". Circuit rider programs involve experts who meet with targeted groups of market actors to address their specific needs and issues, enhance their knowledge, and modifying their practices. The circuit rider efforts are different from classroom training programs, but still may include a traditional training component. Circuit rider programs are designed to be a more recipient-customized endeavor, with experts providing focused technical assistance, addressing the unique concern of the audience. Further, since any meeting is intended for a single audience (for a single firm or for a single project), the assistance can truly cater to the group's specific project requirements.

Following a discussion of the general nature of circuit rider programs in the energy efficiency industry, this paper describes in detail a couple of recent and ongoing circuit rider programs. The first is a circuit rider program that was focused on promoting improved compliance with new energy codes, and promotion of beyond code designs and construction. The second example focuses on a circuit rider effort that is designed to promote high performance lighting and daylighting designs for school facilities. In these examples, we describe types of markets actors we have worked with, issues addressed, impacts, benefits, and challenges for these projects.

Overview of the Circuit Rider Technical Assistance Process

"What's a circuit rider?" is a question that comes up at almost all circuit riding sessions. Modern day circuit riders take their name from preachers who traveled from church to church in the American frontier, delivering the gospel to towns that could not afford a full-time cleric. Some rural areas of the United States still utilize the circuit-riding model for religious services, but the term is now more frequently used to describe technology consultants who work in a variety of industries. Computer, management and energy efficiency consulting are all businesses that participate in circuit riding activities.

Unlike traditional training that is designed to deliver a specific knowledge set that hopefully addresses the needs of the audience, circuit riders provide a flexible assistance service that is designed to deliver exactly what the recipient is seeking. Foundations and other granting organizations often fund circuit rider projects in order to improve the technological know-how of their grantees, thereby maximizing the positive effects of their efforts. In other cases, community of related businesses or nonprofit organizations pools their resources to hire circuit riders to address similar training needs.

Successful circuit rider training emphasizes a peer-to-peer approach in which trainers work out problems with clients in an interactive process. Typically this training takes place in small groups so that interactivity is facilitated. Training is not only adapted to the client's issues, but often clients are asked in advance to assemble projects, issues, and problems to be addressed at the sessions. Pre-training surveys are often conducted to gauge the knowledge level of the particular client.

One of the chief attributes/advantages of circuit riding is the number of employees that are reached at a particular organization. For formal off-site training, most companies will send one or two employees who may or may not transfer the knowledge to others. With circuit riding efforts, several key staff members are typically reached with 10-15 employees being the typical working group.

For circuit riding to succeed, there must be the opportunity for at least limited follow-up. Circuit riders establish a relationship with their clients, and should be available to offer post-session assistance. This is sometimes funded by the granting organization, and sometimes a fee for service relationship is established.

Circuit Rider Program Example 1: Energy Codes

This circuit rider technical assistance example is associated with a large effort that was undertaken in Massachusetts shortly after its new energy code went into effect. Through this effort, approximately 150 comprehensive circuit rider meetings were conducted.

During the past several years, a considerable broad-based effort has taken place to introduce new, more aggressive building energy codes. For commercial buildings in general, the new energy codes are primarily based on ANSI/ASHRAE/IESNA Standard 90.1-1999, and Chapter 8 of the 2000 International Energy Conservation Code (IECC). The IECC has become a model to which many states interested in new energy codes modify to create a code suitable for their jurisdictions. Several states have already adopted new energy codes, and many others are in the process of making modifications to ASHRAE 90.1 or the IECC as they develop their specific code. New energy codes present a number of new requirements for buildings and building systems that will result in higher levels of energy performance.

The latest Massachusetts energy code became effective on July 1, 2001. The code is based on ASHRAE/IESNA Standard 90.1-1989R and the IECC, but there are some significant changes and some elements of the code are far more aggressive than energy codes being adopted by most other states. Specifically for the building envelope, the Massachusetts energy code has unique requirements that call for both air and vapor barriers in all new commercial buildings.

Technically, most of the new state energy codes have a number of requirements that many in the design community believe will be a challenge for compliance. Commercial code requirements address building envelope, HVAC systems, and electrical /lighting systems.

Regardless of whether we focus on Massachusetts or other states, the new energy code requirements are far more challenging than previous mandates. A variety of services have been and will continue to be required in order to support design professionals, building contractors, and others to effectively comply with the codes.

Formal Classroom Training

When a state introduces a new energy code, a common practice is to offer classroom style training for code officials and members of the design and building community. Such training sessions are intended to introduce participants to the code requirements, both technical and administrative.

In the Massachusetts code training sessions had been offered with modules focused on the building envelope, HVAC, or electrical sections of their new code, or on the COM*check-EZ* compliance software. The various modules each last four hours and are formal PowerPoint type presentations. While some opportunity exists for questions, these training sessions are intended to address the more general needs of a large audience. While sessions are very valuable, the format limits the ability to address detailed specific issues that an attendee or their firm may have.

Circuit Rider Technical Assistance: Discussion of Benefits and Process

Energy code circuit rider technical assistance services described in this paper are intended to be an additional important element in moving the building community to higher levels of energy code compliance. In contrast to formal training, these services are focused on serving the specific needs of a participating firm. The sessions are informal and without a structured agenda. It is the participant's responsibility to define their needs, to bring up specific points related to the code for clarification, and to have specific projects ready for discussion. (attendees are made aware of this responsibility ahead of time). Additionally, the sessions are conducted at the participating firm's office, thereby simplifying and encouraging attendance of a larger percentage of their organization.

The goal of circuit rider sessions is to clarify any confusion or misunderstanding that building design and construction professionals may have about new energy codes, and to support their efforts to better understand designs that are compliant with the codes. Sessions are an opportunity for peers to review designs and discuss how they satisfy or fail new code requirements.

Energy & Resource Solutions (ERS) has been involved in two energy code circuit rider projects, both conducted in Massachusetts. The first was the Northeast Energy Efficiency Partnerships (NEEP) Energy Code Pilot Project. The second project consisted of the Massachusetts Board of Building Regulations and Standards (BBRS) Energy Code Technical Assistance Program (TAP). The NEEP pilot project ran from May through November of 2001, and included 28 no-cost, on-site consultations with architectural/engineering firms. Shortly after the completion of the pilot program, the BBRS TAP program started, and ran through March of 2003. Approximately 120 circuit rider sessions were conducted through this program. Both the pilot and full-scale BBRS program were similarly structured, consisting of three-hour sessions conducted in the design firm's office, facilitating open discussion addressing specific questions or project plans. Sessions were typically attended by 15-20 design professionals and addressed compliant design solutions for: envelope details (insulation, air, and vapor barriers); HVAC system sizing, equipment, and controls; and lighting technologies and control applications. The Sessions allowed the design community to accomplish the following:

1. Better understanding the actual requirements of the code

2. Be better versed at technical approaches for complying with the code
3. Learn approaches for efficient design and construction practices
4. Think more creatively and resourcefully

Based on verbal feedback and formal evaluation forms, the circuit rider efforts were very favorably received. With minimal promotion, there was great interest in the sessions and the program was completed with a significant backlog of clients that could not be helped due to the budgetary limitations of the programs. To date, the NEEP Pilot Project and the BBRS TAP have demonstrated a potential to truly improve fundamental building design practice and transform the market.

Typical Topics Addressed Through Sessions

The circuit rider sessions addressed the new Massachusetts Energy Code. Sessions addressed a broad range of energy code topics that fell into the following areas. [1]

Administrative requirements. Architects, engineers, contractors, and building owners seemed uniformly to have a need to understand the compliance process, the parties responsible for ensuring proper compliance, and consequences of non-compliance.

Building envelope requirements. There was considerable confusion about air and vapor barrier requirements. Session attendees also found the insulation requirement tables challenging to interpret.

Building HVAC requirements. The largest topic of concern for mechanical systems was associated with load determination and system sizing. Other topics regularly addressed at the sessions included air economizers, heat recovery requirements, and the availability of equipment at certain efficiency levels.

Building electrical system and lighting requirements. The most common lighting systems topic was how to meet control requirements. There is a general lack of familiarity with controls, and designers needed assistance with understanding code requirements. For example, many firms were unfamiliar with design techniques and technologies that would both allow adequate lighting levels and comply with the code. Most firms were unsure of the reasons for choosing to use the "space specific" or "whole building approach to show compliance with the lighting power density requirements.

Circuit rider observations. It was readily apparent from most circuit rider sessions that energy efficient design practice has not been a high priority for many architects and engineers. The level of competence on the subject of energy efficiency is low compared to other architectural design subjects they address. Most disturbing was the fact that many firms were now beginning to make design choices based solely on code lighting power density levels, resulting in over-lighting.

[1] While code-specific comments discussed at the sessions are specifically associated with the Massachusetts code, the issues general apply to most new state codes since they are based on ASHRAE 90.1 or the IECC as in Massachusetts.

Attendee perception of codes and compliance. While most session attendees were interested in learning what was necessary for code compliance, there was a general sentiment that the code was overly strict and that compliance would be a huge and costly burden. While architects and engineers who attended sessions said they would do all possible to develop compliant designs, contractors claimed they would do what was necessary in an effort to remain competitive.

Attendee perception of other design and building community disciplines. There seemed to be a uniform sentiment among design professionals that members of their own field could, and would, do a good job with code compliance. However, members of each discipline felt that code compliance would be a significant problem for members of other design disciplines. In short, architects and engineers did not express confidence in each other, and neither group had confidence in a contractor's ability to install or build systems to the designer's code-compliant designs. In turn, contractors generally believe that they are being required to install systems that might not be properly conceived.

Conducting Effective Circuit Rider Sessions

Our fundamental objectives for the sessions were to help participating design professionals understand whether their designs were code compliant and how to improve their overall practice regarding design and construction of energy efficient buildings. In addition to the technical role that session experts played, they also needed to be effective in the important function of session facilitator. In this role, the advisors had to be animated and dynamic. In effect, they had to be prepared and capable to motivate the group to ask questions, maintain focus, and limit potentially disruptive digressions. Our experience leads us to conclude that these interpersonal abilities, as much as technical expertise, were necessary to ensure support sessions were of high value and impact. Session facilitators were prepared to perform several functions and address several topic areas as listed below.

Code clarification and interpretation. While specific plans provided a basis for discussing some of the attendees' concerns, there were frequently other questions that did not strictly relate to a specific project. The project team's expert advisors were prepared to discuss any area of the energy code. In this regard, we supported participant efforts to clarify or best interpret particular sections or paragraphs of the code. When questions arose on the code for which we did not have an immediate response or clarification, we made attendees aware that we would discuss these details with other team experts or the BBRS, and then provided a follow-up response shortly thereafter.

Education on technical approaches (Envelope, HVAC, and Electrical/Lighting). Frequently, session attendees understood the basic requirements outlined in some section of the code, but did not understand the technical approaches necessary to best comply. In these circumstances, the project team's expert advisors led relevant detailed discussions or offered alternative design approaches, technical equipment and systems, or construction techniques. Our team members brought documents with sample drawings or prototypical example materials to help educate attendees. We also presented information on additional technical resources that would be helpful to session attendees in improving their overall design approach as it pertains to energy efficiency.

Indicators of Success

Project team members viewed our role in the circuit rider sessions as consultant on energy codes and energy efficient design practice, "explainer" of code administrative requirements, and liaison between session participants and the State of Massachusetts.

We also had an additional major role: calming session attendees and motivating them to be more effective with code compliance and energy efficient design. Since participants did not see us as state officials who were judging their practice, they tended to be very open. In turn, they were highly receptive to listening to our perspectives and seemed willing to consider a transition to more efficient design practices.

Immediate implementation of design ideas. At several sessions, design firms made on-the-spot revisions to plans that were in progress. These changes involved building envelope details, HVAC control specifications, lighting fixture and design choices, and lighting control details.

Promotion of circuit sessions. The energy code sessions were largely promoted through announcements at formal classroom code training sessions and through emails to groups of past training attendees. The level of interest in the sessions was substantive, as gauged by the ease in promoting sessions and recruiting participating firms, despite the limited number of email solicitations.

Number of session attendees. For each circuit rider session, there was a desire to get at least 10 attendees. In general, sessions had far greater attendance than this. In fact, at 35% of the sessions more than half of the firm's professional staff came to the sessions. The largest session had more than 70 attendees.

Verbal comments during sessions. At all sessions, attendees openly complemented the program, claiming that this customized approach was highly valuable and uniquely adapted to the cause of motivating higher levels of code compliance. Many participating firms and attendees asked if additional sessions could be arranged, either for others in their firm who could not attend or to discuss other specific projects and problems.

Formal session evaluations were uniformly positive, with respondents claiming the sessions were valuable and would result in improved compliance and implementation of buildings systems that exceed code requirements.

There has been continued interest in circuit rider sessions, even after completion of the program. There was a significant backlog of interested firms after all available sessions were completed.

Circuit Rider Program Example 2: High Performance Lighting Support

This second example is associated with a comprehensive support project for a high performance lighting program, the Design Lights Consortium (DLC). The purpose of the DLC Training and Support circuit rider project is to enroll lighting distributors as active partners in the DLC. In certain types of projects the distributor is instrumental in selecting equipment and in influencing design. However, distributors tend to make recommendations based primarily on

price, without taking into account other considerations that might improve lighting quality and efficiency.

While training is an important part of the educational strategy, experience has shown that project analysis/assistance is equally important to the success of a partnership program. For this reason, ERS is also providing design assistance through the program. This assistance includes reviewing designs, recommending more efficient and higher quality designs where appropriate, and working with design teams to get the designs accepted. ERS does not become the principal lighting designers, but act as circuit rider consultants to the design team. We anticipate that as we work with the distributors through this ongoing project, they will see and understand the benefits of these enhanced designs, and will come to promote lighting systems and designs of higher quality and efficiency to their customers.

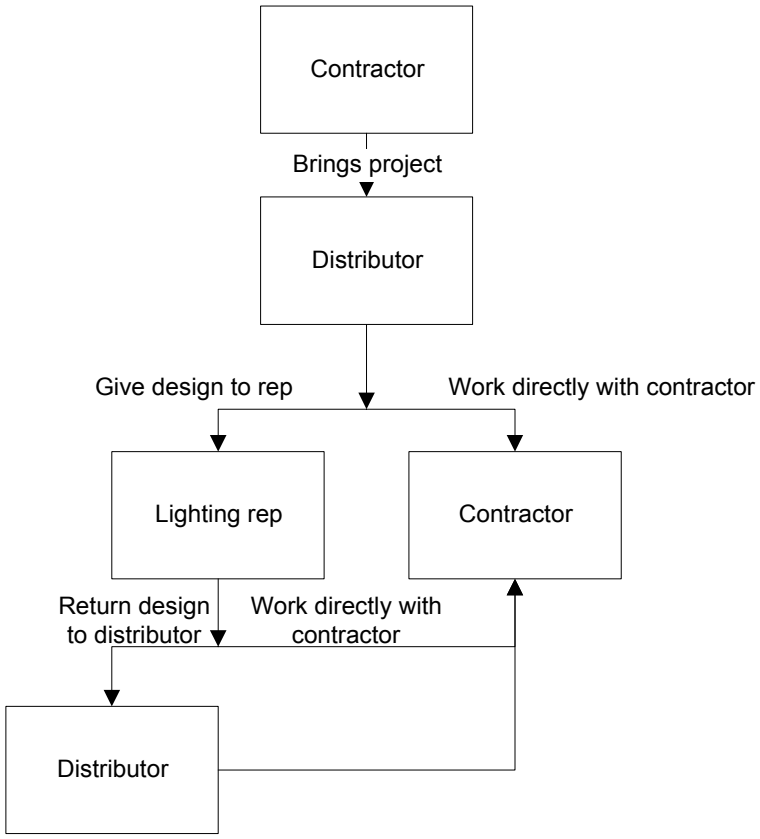
The Lighting Design Process

The lighting design process differs according to the size of the project. While the demarcation varies according to the type of facility and complexity of the work, in general small projects are those of less than 5000 square feet. Generally, in a small project, an architect or engineer is not involved in the design process. The contractor is typically responsible for the lighting design. The contractor goes to the distributor, who may provide design assistance or who may contact a lighting rep. for assistance. The distributor will then present the design to the contractor who makes the purchase and does the installation. In some cases the lighting rep works directly with the contractor, based on an agreed upon financial arrangement with the distributor. This process is illustrated in Figure 1.

For large projects an architect/engineer is usually involved. Most architecture firms do not include trained lighting designers, so they subcontract the lighting design to either a lighting designer or an electrical engineer. Both these entities work to a greater or lesser degree with lighting representatives to develop specific designs. Outside of the design community, it is relatively unknown that lighting reps play such a key role in the design process. The lighting representative will in general present the design to their client, who will adopt it as their own. The contractor then chooses a distributor, who at that point has little or no input in the design choice. The distributor then places the order with the lighting rep. This process is illustrated in Figure 2.

Both sizes of project place the lighting rep in a key decision making role. The lighting industry is one of the few industries where the independent representative has survived as a central player. Massachusetts has six or eight large lighting representation firms, all of them representing a wide variety of manufacturer lines. This gives them the flexibility to pick and choose among products according to the exigencies of the designs. The reps initially attracted customers by providing value added services. These large firms have their own lighting designers and Computer Assisted Design (CAD) shops, produce designs at no additional charge, and allow their clients to use them under the client's name. For this reason, not only distributors, but also electrical engineers and architects will often turn the design over to the lighting rep.

Figure 1. Small Lighting Design Project Flow

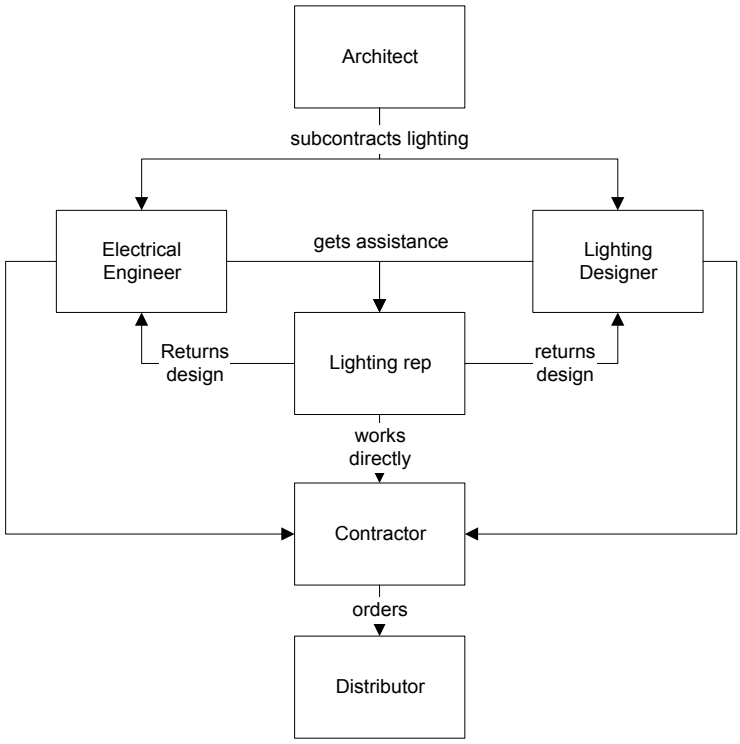


Example Circuit Rider Site Visits and Progress

Based on their influence on lighting design, lighting reps and electrical distributors are a primary focus of the high performance lighting circuit rider program. One sample experience was with Hampden Electric Supply, a large firm that was founded in the early 1930s. In 1963 it was combined with M.W. Zimmerman Electric Supply and incorporated under the identity R.P.S. Inc. The company presently has three Massachusetts locations, 65 employees and sales of over $20 million/year.

Hampden/Zimmerman specializes in commercial and industrial lighting products and services. They offer an extensive product line and also offer assistance with energy conservation proposals, including ballast and lamp retrofits, fixture replacement, daylight harvesting, occupancy sensors, and other technologies. They maintain an on-staff engineer to recommend products and layouts of distribution systems for new and existing facilities. Hampden/Zimmerman was at one time an active DLC partner but their activity has dropped off over the past 1-2 years.

Figure 2. Large Lighting Design Project Flow



Two sessions were conducted. Approximately 15 people attended the first, and eight the second. The audience included both management and sales staff. As a result of the training, sales managers instructed their staff that the DLC program was a priority, and that they should contact their contractor customers to solicit projects. The projects will come back to the sales managers who will work with ERS on designs that further the objectives of the DLC program. Within a week, two projects were identified. One of these, Tri-County Schools, is the subject of continued circuit rider support as ERS works with Hampden Zimmerman and the school to effectively implement a premium lighting design.

Lastly, Hampden Zimmerman requested a "point-–of-sale" literature stand for Design Lights literature. Western Massachusetts Electric Company is providing the stand. We intend to follow up on a monthly basis with this and other distributors that receive support through the DLC circuit rider program. In summary the circuit rider efforts have reactivated Hampden Zimmerman as a DLC Partner.

Other Circuit Rider Activities

Through the DLC circuit rider project, ERS has visited directly with numerous lighting equipment supply operations. Our efforts are being expanded to address architectural and engineering firms, as well as building owners that are potentially interested in incorporating high performance lighting design features into their new construction projects. Preliminary feedback from service recipients has demonstrated that there is a very high demand for these services, and that quality of installed projects increases dramatically with moderate design support.

Concluding Remark

Our experience providing circuit rider technical support sessions has consistently demonstrated that there are significant improvements in energy efficiency practice following the customized sessions that have been offered through the programs described in this paper. Client firms have continually indicated that they would be better able to comply with new energy codes as a result of the circuit rider sessions (code program), or better able to develop high performance lighting designs as a result of the support they have received. Such enhanced focus, capabilities, and receptiveness are indicators of the general value and success of these circuit rider technical assistance efforts.

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