Cracking the Nut on Split-Incentives: Rental Housing Policy

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ABSTRACT

As communities throughout the country adopt aggressive plans to address climate change, many struggle to overcome the "split-incentive" that prevents wide scale adoption of energy efficiency upgrades in renter-occupied properties. The City of Boulder, Colorado has taken the lead by adopting the nation's first energy code for rental housing. The policy, "SmartRegs", has achieved phenomenal results through a combination of innovative policy design, consulting services, incentives through a local carbon tax and American Recovery and Reinvestment Act funding, and key community partnerships.

This paper presents a case study of the success that Boulder has achieved by developing the SmartRegs policy for rental housing energy efficiency and enrolling rental properties in a newly offered one-stop shop energy efficiency upgrade service, EnergySmart. The EnergySmart services provide personalized consulting and upgrade assistance by a team of energy advisors. The launching of the EnergySmart service with a pathway tailored for SmartRegs compliance has enabled many rental units to complete energy upgrades for policy compliance and beyond with measurable results.

In the first year of the EnergySmart service, over 2,500 rental units have enrolled as a direct result of the SmartRegs policy, and over 1,000 units have completed energy upgrades, well in advance of the SmartRegs compliance requirement date of January, 2019.

This paper outlines in detail the creative policy instrument which uses a performance-based approach and has maximum flexibility to address all residential building types, program offerings that complement the policy, lessons learned, and summarizes the results of the rental housing market transformation that have been achieved.

Introduction

In 2006, the City of Boulder adopted a Climate Action Plan (CAP) to reduce greenhouse gas (GHG) emissions by 23 percent (to 7 percent below 1990 levels) by 2012 and Boulder voters passed the CAP tax, the nation's first tax[1] exclusively designed for climate change mitigation. This local action is part of a global effort in response to increasingly serious forecasts regarding the long-term effects of increased greenhouse gases in the atmosphere. The implementation of the CAP involves activities across several city departments and operations and includes various strategies to reduce GHG emissions.

One of the primary strategies identified for reaching this goal is to reduce energy use in buildings, which account for 76% of Boulder's total greenhouse gas emissions (City of Boulder 2011). Since 2007, the City has implemented several energy efficiency standards which require

[1] The tax is levied on electricity use (per kilowatt hour of usage). It currently generates approximately $1.8 million annually. Most of the tax is dedicated to energy efficiency.

residential and commercial new construction, remodels and additions to exceed 2006 International Energy Conservation Code (IECC) minimum standards (City of Boulder 2011).

While these standards consistently push the envelope as far as exceeding IECC standards, the number of new buildings and homes constructed or remodeled pales in comparison to the number of existing homes and buildings that are not impacted by these codes. As a university town, rental housing comprises over 50% of the existing housing stock (Brautigam & Featherston 2010). For many of these rental properties, a split incentive was preventing the cost-effective implementation of energy efficiency upgrades. In rental housing, the "split incentive" is a market-failure whereby neither the property owner nor the property occupant has a financial incentive to implement energy efficiency upgrades, even where those upgrades would quickly pay for themselves through energy cost savings. The property owner lacks a financial incentive because they do not pay the cost of utilities and therefore does not recoup their capital investment in energy efficiency through the utility cost savings. Conversely, the occupant lacks a financial incentive to make energy upgrades to a property that they do not own, as oftentimes even cost-effective energy efficiency improvements would not pay for themselves during a one or two year lease. Since the majority of the city's housing stock is rental housing, it has been a long-standing priority of the City of Boulder to overcome this split incentive.

SmartRegs, the nation's first energy code for rental housing was born from the need to address the split incentive in rental housing in Boulder. However, it was recognized that the regulatory mechanism would need to be coupled with incentives to effectively approach this segment of the housing stock.

At the same time that initiatives were underway to address rental housing, the city's CAP services were being redesigned based on lessons learned in the first few years of implementation. The city offered energy audits through a Residential Energy Audit Program for three years until a similar service was offered through a utility demand side management program. The city's experience with the audit program showed that there were still barriers to implementing energy efficiency (Martel 2009). It became clear that simply offering energy audits did not overcome the barriers to completing energy upgrades. Several barriers were still preventing the implementation of energy upgrades, including: property owners not having the time to initiate the bid process, knowing which contractors to trust, deciphering their audit reports, and navigating the various rebates and tax credits that are available (National Renewable Energy Laboratory 2010).

The EnergySmart program was developed in response to these barriers. EnergySmart provides one-stop shopping for energy efficiency through a targeted approach, tailored to each housing type. A point person or "energy concierge" or "advisor" translates technical audit information, assists in getting bids from pre-qualified contractors, provides direct-installation of certain energy efficiency measures at the time of audit, navigates rebates and provides financing. Having a point person for all the steps from audit to action was the next evolution for this program. EnergySmart addresses the split incentive barrier with a specific pathway for rental housing, offering services and incentives tailored to the SmartRegs policy.

The unique combination of an enabling policy and a program partnership has led to a large number of retrofits in existing housing in the City of Boulder. This paper explores the development of the policy and the program, the successful partnership between the two, and highlights results and lessons learned.

Policy Development: SmartRegs

In exploring the most effective approach to addressing energy efficiency in rental housing, the city looked to other communities that have ventured down the residential energy conservation ordinance (RECO) road and their experiences. Analyses explored RECOs in places such as Berkeley, Wisconsin, Burlington, and San Francisco (Kinney et al. 2008). Consultants provided recommendations as to how Boulder could build upon existing information and create the next evolution of a RECO type policy. Recommendations included removing barriers, demonstrating and encouraging creative approaches, providing education and training, developing an infrastructure to handle demand, and facilitating financing (Kinney et al. 2008).

Many of the aforementioned considerations were factored into the creation of a regulation. The city also acknowledged the benefits of adopting a performance based energy code[2], the direction of industry trends (Baker 2011). Because homes operate as a system, an ideal world approach to energy efficiency codes would be performance-based (Neiger et al. 2010). Using a performance-based approach in a Boulder code would be a substantial difference from previous policies of this type and provide a level of flexibility to property owners needing to comply with a new code. The performance-based approach simultaneously addressed two primary concerns expressed by rental property owners: (1) that credit is given for energy upgrades made to properties prior to the regulation; and (2) that property owners would be empowered to choose their own means of compliance.

To pursue this methodology, case studies were completed on a variety of housing types of different vintages to assess the baseline energy characteristics of Boulder's housing stock and establish a starting place to test an energy performance standard. In addition, the City of Boulder allocated funds to be used for a retrofit case study to measure the energy savings from energy efficiency measures in a sampling of Boulder rental properties. From a group of over 120 applicants, five case study homes were selected. The homes represent some of the major rental housing typologies in the City of Boulder: single-family detached (one early 20th century bungalow style and one 1960's ranch style), townhome-style (one interior unit and one end unit), and one apartment- style multifamily unit. The resulting recommendation was to require rental housing to meet a performance standard through the Home Energy Rating System (HERS) of 120 (or the equivalent of 20% less efficient than the 2004 International Energy Conservation Code (IECC)). Consultants concluded that achieving a HERS 120 was both realistic and obtainable for most properties in the City of Boulder (Neiger et al. 2010).

This performance-based approach, built upon the Home Energy Rating System, allowed for the most accurate energy modeling of baseline conditions and the quantification of the energy savings and GHG emissions associated with improvement measures. However, in the case of existing homes, or a rental housing energy efficiency ordinance, a performance-only pathway is not practical due to the cost associated with having a HERS rating performed both before and after improvements (Neiger et al. 2010). This led to the development of an alternative pathway to the performance approach - a prescriptive pathway based on the performance standards recommended through the policy.

In order to craft a prescriptive compliance pathway, there were two main barriers that had to be overcome: (1) accounting for the lack of a "baseline home," since existing homes start at

[2] A performance based code specifies requirements according to performance criteria for the building as a system rather than to specific building materials, products, or methods of construction. As opposed to a prescriptive based code which specifies requirements according to particular materials and construction methods.

varying levels of energy performance and (2) accounting for the differences in housing typology, since energy performance varies by housing type (e.g., multi- family vs. single-family) (Neiger et al. 2010). Since the majority of landlords and rental housing inspectors didn't have any background in building science or energy efficiency, it was important that this prescriptive pathway provide much-needed guidance for landlords to prioritize the energy efficiency impact of various improvement measures and to understand how improvement measures work together. The prescriptive option needed to provide a landlord with a clear pathway to compliance and to incentivize the most cost-effective route to the largest carbon emissions reductions; thereby preventing well-meaning landlords from implementing unnecessary or misguided improvement measures.

In order to provide maximum flexibility to property owners and address these barriers, both a performance (HERS rating) and prescriptive pathway to compliance were developed and included in the policy recommendation. The consultant developed a prescriptive points system weighted such that achieving 100 points is roughly equivalent to achieving a HERS Index of 120, or 20% *less efficient* than the 2004 IECC (with some variations because the prescriptive pathway is more carbon-focused than the HERS). The prescriptive pathway is designed to simplify the process for landlords while not compromising the integrity of the building performance standard of this energy code. The design of the prescriptive checklist is adaptable, easy to use for a professional trained in building science and can be used for all housing types, multi-family or single family (Neiger et al. 2010). The latest version of the city's prescriptive list can be found on the SmartRegs website (City of Boulder 2012).

Stakeholder Process

While developing this policy, city staff began holding meetings with a community working group that included representatives from: Boulder Area Rental Housing Association, University of Colorado at Boulder Off Campus Student Services, Boulder Housing Partners (affordable rental housing), apartment owners, and licensed rental housing inspectors. The group was convened to discuss ideas and formulate proposals for updates to the housing and rental licensing codes as well as options for energy efficiency requirements to existing rental housing units to address CAP objectives. A subcommittee on energy efficiency addressed the proposed regulation, how to align the requirements with the rental licensing process, GHG emissions reduction targets, reasonable investments, the possibility of spending caps, and verification of energy savings.

An overall outcome of this process revealed the need to have any regulation paired with incentives and assistance to compliance in addition to providing time for property owners to accrue capital to complete these investments. After a long process, an agreeable compromise was reached. The policy would go into effect on the first working day of 2011, but property owners would have 8 years to comply with the regulation. To prevent property owners from waiting until the last minute, incentives and assistance would be guaranteed in the first three years of the policy implementation period to encourage early adoption. As part of the policy development process, these incentives were essential to the compromise reached with the stakeholders. As the CAP services were being restructured simultaneous to the policy development, the city had the opportunity to create a compliance pathway for the regulation within the transition from an energy audit program to a one-stop shop for energy efficiency with rebates specific to compliance.

Audit to Action: The Birth of EnergySmart

Through the restructuring of the residential energy audit program in the City of Boulder, lessons learned, such as the need to follow up more directly with audit recipients, addressing the challenges of multi-family units, and exploring regulatory approaches to address the split-incentive, a new approach to energy efficiency service delivery was born (City of Boulder 2011). The main objectives of this service were to overcome traditional barriers to investment in residential energy efficiency, create a simple, comprehensive program delivery path, serve the full range of housing types and residents, leverage existing financial incentives, create new financial incentives to drive participation, and promote a robust contractor base (Ellsworth et al. 2010).

This development process involved a thorough design evaluation that included extensive research; stakeholder meetings and input; analysis of market conditions, budgets, and potential energy and GHG impacts and identification of alternative delivery options. The result was a complete program design that included the following components: customer intake, including both prescreening and scheduling; energy audits, including both comprehensive and walk-through audits; energy advisor services; direct installation of simple energy-saving measures at the first visit; a pre-qualified contractor network; ongoing engagement, including bid evaluation and installation support; financial incentives, including rebates and financing; robust program administration; quality assurance and control; and most importantly, flexibility (Ellsworth et al. 2010). The resulting program was initially named "Two Techs and a Truck" and later renamed "EnergySmart[3]."

As the city was completing the design of EnergySmart, Boulder County was compiling an application for a large, competitive Department of Energy grant through the American Recovery and Reinvestment Act (ARRA). The proposed program design of EnergySmart was included in the grant proposal with the hope of launching this service to the residential sector throughout Boulder County (the City of Boulder is one municipality located within Boulder County). The grant was awarded, resulting in a large-scale energy efficiency service launched throughout Boulder County.

Of great importance to the city's process with SmartRegs, was the design of a compliance pathway through EnergySmart where property owners and landlords could participate in EnergySmart and receive services and incentives tailored specifically to compliance with SmartRegs. Instead of an energy audit, participants would be assigned a licensed inspector who could provide an audit based on the prescriptive checklist; instead of an audit report they would receive a report guiding them to the most cost-effective way to comply with the policy; the energy advisor assigned to their property would be an expert in the SmartRegs policy, assisting the landlord through to compliance; and rebates and incentives would be packaged specifically for rental properties. The entire service would be subsidized through the EnergySmart program and city CAP funding, providing a low-cost, user-friendly means to comply with SmartRegs early in the policy implementation period.

The city was able to contract with the county-wide EnergySmart program administrator to administer the SmartRegs compliance pathway in the City of Boulder, resulting in advisors specifically trained in policy compliance, a pool of licensed inspectors partnering with the service, rebates specifically for upgrades made to reach policy compliance, a multi-family

[3] Funding for EnergySmart and SmartRegs incentives currently comes from both the ARRA grant (~80%) and the CAP tax (~20%).

building track (including sampling of units), quality assurance and a robust tracking and data collection system. The service has been in operation for over one year and the results have been incredible.

Results

The EnergySmart service offers great value to homeowners and landlords in the City of Boulder. Of the 3,297 participants within the city, 23% (758 homes) are homeowners choosing to invest in the energy efficiency of their homes, while the remaining are rental property owners. With a 67% conversion rate of audit to implementation of energy efficiency (for homeowners), over 500 homes have completed an upgrade. In combination with direct install measures, this work has avoided an estimated 1,197 metric tons of carbon dioxide, and approximately $166,389 in energy costs per year.

While there are great benefits to homeowners participating in the EnergySmart service, such as increased comfort and lower energy bills, their participation is completely voluntary. Owners and managers of rental properties may reap similar benefits in their properties for tenants, but have the added incentive of assistance complying with a mandatory requirement. Although compliance with the SmartRegs ordinance is not required until 2019, the guidance and rebates offered by EnergySmart are guaranteed only for a limited-time, causing a sense of urgency for landlords. As a result, rental units within the City of Boulder comprise 59% of all EnergySmart participation to-date (county-wide), and 77% of participation within the city.

Exceeding goals set for the SmartRegs policy in 2011, the city has seen 2,547 rental units enroll in the service and 1,558 inspections completed. The remaining enrollees are being scheduled or sampled; a sampling protocol is permitted for baseline inspections in multi-family unit buildings, allowing landlords to get a sense of what improvements might be needed before completing inspections for 100% of units. Of those inspected, 42%, or 653 units, were compliant at the initial inspection; nearly 500 of these units made additional, voluntary upgrades that were not required by the SmartRegs policy. Of the remaining 905 units that were not initially compliant, 371 units came into compliance as a direct result of the quick install items provided by EnergySmart, and 88 have made upgrades to reach compliance. Another 157 units have completed retrofits but have yet to reach compliance. The goal for 2011 was to reach 500 compliant properties; as of February 28, 2012, 1,112 units had been deemed compliant. In total, the work completed in units enrolled in EnergySmart for SmartRegs compliance has reduced carbon dioxide emissions in the City of Boulder by 1,089 metric tons, and will save tenants an estimated $144,358 per year in energy costs.

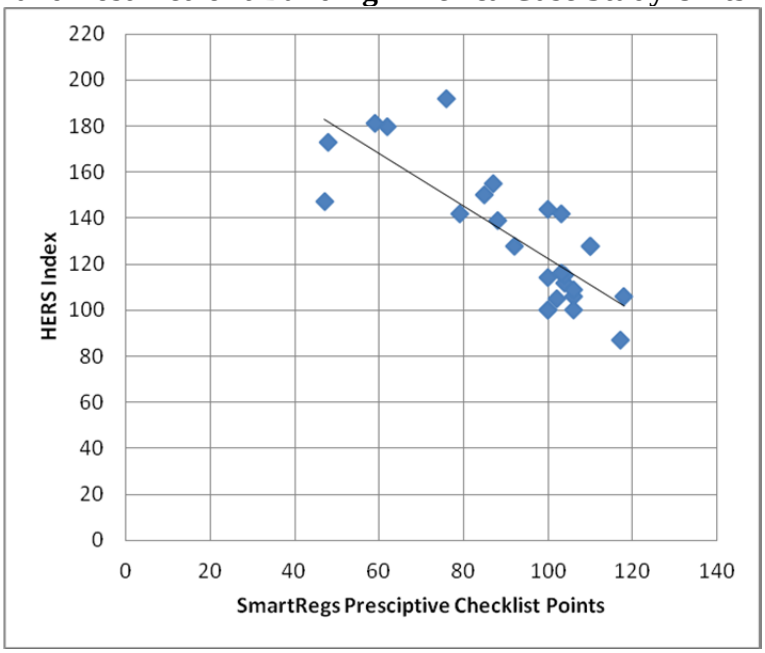
Case Studies and Third Party Evaluation

The City of Boulder partnered with the Building America program's Consortium for Advanced Residential Buildings (CARB) research team to provide case studies and analysis of the effectiveness of the SmartRegs ordinance and its delivery. Through the course of their involvement, CARB provided 9 case studies covering a wide variety of building types and vintages. The case studies focused primarily on three areas: 1) evaluating the alignment between the performance compliance pathway and the prescriptive compliance pathway, 2) analyzing predicted energy and GHG emissions reductions attributable to upgrades made for compliance purposes, and 3) soliciting feedback from the rental property owners on their impressions of the

ordinance and its implementation.

In order to evaluate the level of alignment between the performance and prescriptive compliance pathways, the CARB team calculated the HERS Index for each case study unit using REM/Rate software. Further, in addition to calculating an "as-is" HERS Index, CARB used the prescriptive checklist to craft a theoretical, "post-retrofit" compliance pathway for each case study unit to achieve 100 points and updated the corresponding REM/Rate models accordingly. Through this exercise CARB determined that the prescriptive compliance pathway, despite requiring significantly less time and expense to implement than a HERS Rating, offered results that were well aligned with the results of the performance compliance pathway (Arena & Vijayakumar 2012). Figure 1 below illustrates the relationship of the SmartRegs prescriptive checklist score to the HERS Index for each case study unit, including both the "as-is" results as well as the theoretical "post-retrofit" results. While individual results may vary due to the wide variety of housing type, building characteristics, and building vintage, the trend line indicates that a unit with a HERS Index of 120 should earn nearly 100 points on the SmartRegs prescriptive checklist, and vice-versa.

Figure 1. Relationship of HERS Index to SmartRegs Prescriptive Checklist Points for Pre- and Post-Retrofit Building America Case Study Units



Source: Arena & Vijayakumar 2012

CARB's study of the calculated energy use reduction attributable to landlords' SmartRegs compliance upgrade activities in previously unimproved rental housing predicts savings of 23% - 52% (Arena & Vijayakumar 2012). Among these same units, the report reveals an average estimated annual energy cost savings to tenants of $361/year and an average estimated greenhouse gas emissions reduction of 28.1% (Arena & Vijayakumar 2012).

Lessons Learned: Conclusions

The customized pathway of the EnergySmart service has resulted in a large-scale successful launch of the SmartRegs regulation. The SmartRegs ordinance, coupled with the EnergySmart energy advisor delivery vehicle, represents a scalable model for overcoming the split incentive in communities throughout the nation. In addition to offering a comprehensive means to advance residential energy efficiency in the rental housing sector, the development of the SmartRegs ordinance offers several important lessons learned for communities seeking to develop and implement any kind of innovative and effective sustainability policy.

The development of the SmartRegs ordinance highlighted the need to focus on finding simple solutions and common ground. In searching for a method to address the split incentive in the rental housing market, the issue became increasingly complex. The approach needed to balance a comprehensive building science approach but be cost-effective to implement. It needed to be flexible enough to account for a variety of factors: differences in building types, different vintages, historic properties, multi-family housing, and Home Owner Association (HOA)-controlled properties. There were a variety of different competing metrics that needed consideration, including whether the focus should be on actual energy consumption (which is highly occupant-driven) or on predictive energy modeling (which effectively removes the occupant). There was a desire to avoid reinventing the wheel, but there was a lack of any green building programs that could easily be adapted to address the existing home market in a non-renovation context.

Amidst all of this complexity, the city's consultants made a conscious effort to develop a recommendation that was as simple as possible. More than anything else, this methodology informed the development of the SmartRegs prescriptive pathway. The consultants began with the assumption that no matter how disparate the vintage of houses or housing type, there were still many more commonalities than differences; every type of home has some form of windows, walls, ceilings, heating equipment and water heating equipment. While the team acknowledged that there was a vast amount of variation amongst these basic elements, they made a conscious decision not to let this complexity cloud the formulation of a solution. Once a solution was crafted, it could be tuned and tweaked to account for the differences.

Focusing on finding a simple solution also sometimes means focusing on the low-hanging fruit. While the city sought a comprehensive solution to address the split incentive in rental housing, it was important to recognize that not each and every problem identified could be solved. For example, many stakeholders identified occupant behavior as a major factor in the overall energy consumption of a building. Property owners argued that because there was no way to consistently alter occupant behavior that passing a rental ordinance wouldn't solve the entire problem. In the case of rental energy conservation, it became apparent that altering occupant behavior was not a reliable and predictable means of addressing the problem. While occupants may have a large impact on the overall consumption of a building, there was still the potential to make a large impact by requiring property owners to implement cost-effective energy upgrades. The SmartRegs ordinance was able to address the most low-hanging fruit by focusing on the area where the city was most likely to predictably and consistently affect change.

Throughout the process of developing the rental housing requirement for energy efficiency, performing case studies on existing rental housing stock as well as involving stakeholders in the process were among the most informative steps taken. Case studies allowed city staff and consultants to understand the state of Boulder's existing buildings, therefore

determining an attainable goal for them to reach. Similarly, discussing these goals and timelines with invested parties not only kept requirements realistic, but allowed stakeholders to feel involved in the process, causing less resistance and fewer unintended consequences to arise when the ordinance was finalized and implemented.

As far as implementation, the energy advisor service model is integral to successful installation of energy efficiency measures in buildings. This is especially true for rental properties, which are typically part of a larger business model. Most property owners and managers are focused on running a business, have little knowledge of building science, and not much spare time to sort through upgrade options, available incentives, and contractor qualifications. In addition to addressing these barriers, the energy advisor acts as an "advocate" for property owners, helping to bridge the gap between private investment and government regulation. Participants in the SmartRegs pathway of EnergySmart have shared much appreciation and positive feedback regarding the assistance they've received.

Regulations can play a critical role in cases where the incentive to upgrade buildings lies with a different party than the recipient of the benefit of those upgrades (i.e., in tenant leased spaces). However, the combination of a regulation with large limited-time rebates has proven effective in driving participation in the EnergySmart service. Numbers for both enrollment and upgrades completed increased during a summer promotion offering double the amount of rebates previously available. In combination, regulatory requirements and financial incentives can drive building upgrades, even beyond the upgrades required for compliance. Of those enrolled in EnergySmart for the purpose of seeking SmartRegs compliance, nearly 500 units that were already compliant took advantage of the service and its available financial incentives to make additional, voluntary upgrades that were not required by the ordinance.

Ongoing engagement and analysis are critical for implementing a new ordinance such as SmartRegs. Creating an awareness and understanding of the requirements among property owners, managers, HOA's, inspectors, and tenants is necessary for cooperation and ultimately, compliance. This was addressed by a number of outreach techniques, including presentations, direct mailing, and online resources. Inspectors are educated and licensed by way of one-day training and exam, in addition to pre-requisites that require basic building science knowledge. A quality assurance component, made possible by the partnership with EnergySmart, is useful in identifying misunderstandings and differing interpretations of the policy requirements. Finally, constant troubleshooting and flexibility is a must, as different unit types, mechanical equipment, and owner-tenant relationships can pose unique challenges.

References

Arena, L. & Vijayakumar, G. 2012. "Evaluation of Boulder, CO, SmartRegs Ordinance and Better Buildings Program." http://www.nrel.gov/docs/fy12osti/54724.pdf. Oak Ridge, Tenn.: Department of Energy, Building America Building Technologies Program.

Baker, L. 2011. "Reconstructing Building Codes for Greater Energy Efficiency". http://www.governing.com/topics/energy-env/reconstructing-building-codes-greater-energy-efficiency.html. Governing.

Brautigam, J. & Featherston, P. 2010. “City of Boulder City Council Agenda: Items related to SmartRegs”. http://www.bouldercolorado.gov/files/Clerk/Agendas/2010/May_18/SmartRegs_Final_Memo_May_18_CC_1st_Reading.pdf. Boulder, Colo.: City of Boulder, City Manager’s Office.

City of Boulder. 2012. “SmartRegs Prescriptive Pathway”. http://www.bouldercolorado.gov/files/LEAD/Smart_Regs/Prescriptive_List_10.24.11.pdf Boulder, Colo.: City of Boulder, Planning and Development Services.

City of Boulder. 2011. “Community Guide to Boulder’s Climate Action Plan 2010/2011 Progress Report”. http://www.bouldercolorado.gov/files/LEAD/CAPAG/CAP_2010-11_Online_9-26-11.pdf. Boulder, Colo.: City of Boulder, Local Environmental Action Division.

Ellsworth, A., Weaver, T., Byers, S., McGuckin, P., & Brainerd. B. 2010. “Two Techs Implementation Plan Final Report”. Unpublished consultant report. July 6 2010.

Kinney, L., Clute, W., McCluney, A., Neiger, D., Regelson, K., Richardson, C., & Tomb, C. 2008. “Residential Retrofit Study in Support of Boulder’s Climate Action Plan: The potential role of Residential Energy Conservation Ordinances and other policy options.” http://www.bouldercolorado.gov/files/PDS/rentalhousing/Energy_Efficiency_Project/Synertech_Report_Background_on_RECOs.pdf. Boulder, Colo.: City of Boulder, Local Environmental Action Division.

Martel, J. 2010. “2009 Residential Energy Action Program Final Report”. Unpublished report. March 8 2010.

National Renewable Energy Laboratory, 2010. “Summary of Gaps and Barriers for Implementing Residential Building Energy Efficiency Strategies”. http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/49162.pdf. Oak Ridge, Tenn.: Department of Energy, Building America.

Neiger, D., Johnson, S., Hutchings, L., Johnston, D., & Damron, D. 2010. “SmartRegs Case Study Final Report”. http://www.bouldercolorado.gov/files/PDS/rentalhousing/Energy_Efficiency_Project/SmartRegs_Final_Report_to_City_of_Boulder_March_26.pdf. Boulder, CO.: City of Boulder, Local Environmental Action Division.