Options for Hayward's Residential Energy Conservation Ordinance

by

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DISCLAIMER

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EXECUTIVE SUMMARY

The City of Hayward is considering options for drafting a Residential Energy Conservation Ordinance (RECO). As a first step, the City must decide upon criteria for choosing design elements for the ordinance. I have surveyed eight RECOs that represent a cross section of possibilities. My examination of theses ordinances has revealed several recurring themes in relation to the successful adoption and effective implementation of the RECO. Based on these observations, I have come to the following conclusions.

RECO Design

The City would benefit from employing a comprehensive RECO design. This would entail developing a building rating system to assess the resource-efficiency or inefficiency of each dwelling, and what improvements should be made to reduce energy and water usage levels. By basing efficiency retrofit requirements on the performance of the whole house, the City will allow property owners the flexibility to perform the improvements that will best fit their situation, thereby increasing the efficiency of the program. This option also rewards innovation, and can serve to encourage the adoption of cutting edge efficiency technologies by building owners. A prescriptive checklist of required basic retrofits could be incorporated into a comprehensive measure, especially when used in conjunction with a home energy efficiency rating system. However, rather than making each building owner adopt identical efficiency improvements, the requirements should be based on the overall efficiency performance of the dwelling.

In order for the ordinance to affect as large a portion of the existing housing stock as possible, the City should employ as many RECO triggers as stakeholders will accept. Typical triggers for RECO compliance are the construction, sale, or remodeling of a building (Zucker, 2004). Another option is the date-certain requirement, whereby all properties within the local jurisdiction must achieve a certain level of energy efficiency by a set date.

Other local governments' experiences with RECO point to the need for an efficient computerized database to track ordinance compliance and outcomes. The database should be used to provide easily accessible online information about RECO status,

energy efficiency and locally available efficiency resources to property owners. This would provide an effective delivery system for building owners to learn about what they need to do, who can do it for them, and how they may finance their efficiency retrofit.

Enforcement is necessary for an effective RECO. The City could require an on-going inspection process for quality assurance, utilizing a home efficiency rating system. Using third party inspectors and conducting random checks on their work could serve to keep the process honest. Permit fees can help to finance the administrative costs associated with the RECO. Providing diverse and sustainable sources of funding would go a long way towards achieving high levels of RECO compliance among property owners. In order for the City to promote energy efficiency in areas with minimal disposable income, low-income communities would most likely need to have upgrades completed without incurring any cost to themselves.

Barriers to Adoption

Industry research has identified several major barriers to the widespread adoption of residential resource conservation practices by property owners. Among these are: lack of information or awareness of energy conservation opportunities, high out-of-pocket costs for improving energy efficiency, and inadequate access to capital (Institute for Sustainable Communities, 2009).

Mitigations to Barriers to Adoption

Public Involvement

To help mitigate these obstacles the city should make a concerted marketing effort in order to familiarize the public with the RECO and its benefits. An inclusive public outreach process from the outset leads to higher levels of stakeholder buy-in and better results regarding ordinance compliance. When conducting public outreach, it is best to avoid jargon and technical language, keeping communications clear and any visual media simple. An effective approach to achieving stakeholder participation in the RECO design process would be to first notify the public of plans to develop a RECO through the mass media. This could be followed by a city-wide survey conducted to gauge the level of public knowledge and interest in residential resource conservation and to identify

perceived barriers to the adoption of residential efficiency retrofits. Using the survey results, the city could target different segments of the population for participation in stakeholder meetings.

Stakeholder meetings would be most effective if they include a collective visioning component where small groups of diverse citizens develop a shared understanding of what would work best in their community. These work groups can then formulate strategies, comparing ideas with the larger gathering. Finally, getting participants to commit to taking personal action will help to cement the progress made during the meetings and spread knowledge of the available innovations to their broader community. This bottom-up approach will foster a sense of ownership of the process, potentially promoting high levels of RECO compliance (Sanoff, 2005).

Financing

Hayward should also work to get as much state, federal, and county energy efficiency funding into the city as possible to help property owners finance improvements and retrofits. Currently available sources of funding include PACE funding through AB 811, HR 1424, the Million Solar Roofs Program, rebates, tax credits, and Energy Efficiency and Conservation Block Grants.

Conclusion

To be most effective, the City may consider committing to a long-term plan with incremental goals that build upon each other. This would allow time for the market transformation and workforce development necessary to achieve a sustainable change in the housing market. Sharing best practices with other cities will improve the chances for success and help to diffuse innovations throughout the market. While adopting a RECO is an important step towards improving the energy efficiency of residential buildings, this action alone will not reach all of the existing housing stock. It would benefit the city to work with the county and state on any other residential resource conservation initiatives that are currently underway.

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PROBLEM STATEMENT AND METHODOLOGY

The City of Hayward is considering drafting a Residential Energy Conservation Ordinance (RECO) as part of the implementation of the Hayward Climate Action Plan, and is currently exploring policy and implementation options. The context for the adoption of RECO is the passage of AB 32, which formalizes 2020 Greenhouse Gas (GHG) emissions reductions targets for the state of California. This report seeks to provide comparative information on RECOs already in place and alternatives to adopting a RECO. The information in this report is derived from a review of the literature and interviews with government officials, environmental consultants, and members of non-profit organizations.

BACKGROUND

AB 32, the Global Warming Solutions Act, was passed and signed into California law in 2006. This bill formalizes the 2020 Greenhouse Gas Emissions reductions targets, directs the California Air Resources Board (CARB) to prepare a Scoping Plan to map out a state GHG pollution reduction scheme, and sets a timeline for the CARB to follow. The resultant Scoping Plan, approved in 2008, sets a specific goal of reducing GHG emissions to 1990 levels by 2020, with a further 80% reduction by 2050. The plan requires California to adopt a regulation requiring mandatory reporting of GHG emissions statewide. The mandatory reporting regulation applies to state agencies responsible for implementing AB 32 measures and industrial facilities that emit high levels of GHG. This requirement is intended to create a solid foundation for determining emissions levels and tracking reductions (CARB, 2008).

The cooperation of local governments is crucial to the successful implementation of the Scoping Plan. CARB has adopted a Local Government Operations Protocol that sets guidelines for municipalities to track and report public-sector GHG emissions, and developing a protocol for tracking private-sector emissions. Tools that local governments can use to assist in determining their local emissions reduction strategies are available on the CARB website. For example, emissions inventories and calculators can be utilized in goal setting (CARB, 2008).

As 25–30% of California GHG emissions originate from buildings and their associated energy use, improving building water and energy efficiency would have immediate positive GHG reduction results (Allen, 2010). Residential buildings "… account for 30% of non-transportation energy use [and] 32% of electricity use…in California" (Merrian Fuller Energy and Resources Group, 2009). A green building strategy modeled on the California Building Standards Commission's (CBSC) Green Building Standards Code (GBSC) is included in the Scoping Plan (CBSC, 2010). The GBSC applies to new construction in all sectors and requires a reduction in water and energy use, diversion of

construction waste away from landfills, and the use of low-polluting materials in order to reduce building-related GHG emissions. Though standards are not yet mandatory, local governments are encouraged to require green building standards more stringent than those set by the GBSC. The Scoping Plan also recommends the creation of a rating system for buildings and addresses the need to retrofit existing buildings (CARB, 2008).

The Residential Energy Conservation Ordinance (RECO) is one of the policy tools that local governments can use to meet retrofitting and green building goals. In this report I compare eight existing RECOs, examining the components of each of the ordinances for best practices. Attention is paid to the design of the RECOs as well as feasibility and implementation. I also explore methods of public outreach to encourage stakeholder buy-in.

The City of Hayward adopted a Green Building Ordinance in 2009, which requires that new residential development and existing residential remodels are constructed using the Green Point Rating System (GPRS) or an equivalent green building standard (City of Hayward Ordinance 08-20, 2009). The GPRS is a green building standard developed by Build It Green, a non-profit organization that works to promote resource-efficient dwellings in California (Build It Green, 2010). Green building standards are guidelines for constructing energy- and water-efficient buildings while conserving natural resources and practicing recycling in the construction process. Currently the city is considering options for drafting a RECO in order to address the energy efficiency of the existing housing stock.

RESIDENTIAL ENERGY CONSERVATION ORDINANCE

The RECO is a policy tool cities and counties can use to improve the energy efficiency of the existing housing stock by requiring property owners to comply with resource conservation standards. RECOs typically are comprised of energy and water efficiency requirements and a verification inspection requirement. They can be applied to single-family homes as well as multi-family rental properties (Reiss, 2007). The county or municipality adopting a RECO must determine how to incentivize compliance, and what governmental department will be responsible for implementation and enforcement (Suozzo, 1997). Costs to the government are usually offset by filing and inspection fees associated with the ordinance.

Research shows that improving the energy efficiency of buildings and appliances could reduce carbon dioxide emissions by 710 to 870 megatons yearly in the U.S. (Cretys *et al*., 2007). This figure represents about 15% of U.S. total carbon dioxide emissions.

Analysis of energy data from 2008 shows that every $1 invested in home weatherization produces a return of $2.72 in savings on utility costs (Environmental Policy Center, 2010).

Research on workforce development finds that every $1 million invested in renewable energy programs results in the creation of 11 jobs and that every $1 million invested in energy efficiency creates 40 jobs (Long Island Energy Partners, 2010).

The environmental benefits of a RECO are GHG emissions reductions, energy conservation, water conservation, and improved air quality in residential buildings (Cone, 2009). The economic benefits of RECOs may include lower utility costs and rebates for property owners and renters, lower equipment maintenance costs for utility providers, market opportunities for local businesses, and workforce development for the business sector (Suozzo, 1997).

Stakeholder groups affected by RECOs include residential property owners and tenants, community groups, neighborhood associations, members of the building trades, renewable energy vendors and contractors, utility providers, realtors, financers, local

governments, and relevant NGOs such as environmental groups and low income housing assistance programs. The overlapping and sometimes conflicting interests of these groups make the successful design and implementation of a RECO a complicated task.

RECO COMPARISONS

Various forms of energy conservation ordinances for residential buildings have been enacted across the nation in the past thirty years. Table 1 below lists eight examples. I have chosen to examine a broad cross-section of ordinances representing different elements and requirements. Six are from cities and counties in California, with one in Colorado and one in Vermont. They include the oldest RECOs in the country as well as newly enacted ordinances. All of the RECOs in this report are mandatory.

Table 1. RECO Example Cases

		Berkeley, CA	Boulder, CO	Burlington, VT	Marin County, CA	Palo Alto, CA	Rohnert Park, CA	Roseville, CA	San Francisco County, CA
Ordinance Name		Residential Energy Conservation Ordinance	Energy Conservation and Insulation Code	Minimum Energy Efficiency Standards Ordinance	Single-family Dwelling Energy Efficiency Ordinance	Green Building Requirement	Energy Efficiency Code	Energy Conservation Audit Requirement	Residential Energy Conservation Ordinance
Administering Agency		Energy Office of the Housing Department	Department of Energy	Department of Public Works and Electrical Department	Building and Safety Division	Planning Department	Building Department	Roseville Electric Department	Office of Building Inspection
Adoption Date		1981	2009	1997	2003	2008	2007	1982	1981
Compliance	Mandatory	Y	Y	Y	Y	Y	Y	Y	Y
	Voluntary								
Target Buildings	Single-Family Owned	Y	Y	Y	Y	Y	Y	Y	Y
	Single-Family Rental	Y	Y	Y	Y	Y	Y	Y	Y
	Multifamily-Rental	Y	Y	Y		Y	Y	Y	Y

Once RECOs are passed by the City Council, they are written into the building code and are commonly administered by the city's energy department or a branch of the local planning department. In some cities, different departments partner to oversee RECO enforcement. In cities where the utilities are publicly owned, the electric department is involved in RECO administration. For example, the electric department in the city of

Roseville oversees the required energy audits (Roseville Municipal Code Title 16). In the city of Burlington, the publicly owned utility company assists the Inspection Division of the Department of Public Works in enforcing ordinance compliance (Burlington Dept. of Planning and Zoning, 2004). With publicly owned utility companies typically charging 40% less than their privately owned counterparts and fully cooperating with local government mandates for renewable electricity generation, cities with public electricity appear to have an advantage in moving forward with conservation proposals (Proposition 16 City of Roseville Fact Sheet, 2010).

The majority of ordinances in this report apply to both single-family and multi-family dwellings that can be either owner-occupied or tenant occupied. Only the Marin County's ordinance excludes multi-family homes from its efficiency requirements; its ordinance applies only to single-family homes with a total dwelling size greater than 1,500 square feet (Ordinance No. 3492). The other outlier is Burlington, VT, where the ordinance only affects rental properties.

An Overview of RECO Triggers and Conservation Elements

Table 2 and Table 3 below compare the example cases in terms of what factors cause the RECO to take effect and what energy conservation measures are required. The tables are divided according to the two different approaches to designing the conservation requirements of the ordinance: prescriptive and comprehensive.

Some local governments formulate a basic checklist of prescriptive energy and water conservation elements that are uniformly required in all buildings affected by the ordinance. Other jurisdictions take a more holistic approach by setting conservation targets that can be met through a variety of means. In Table 2 and Table 3 this is referred to as the comprehensive measures. Cities with comprehensive RECOs still may include a checklist of prescriptive measure. The efficiency technologies listed under the comprehensive heading in Table 2 are non-mandatory improvements that may be used to reach the comprehensive RECO targets. Some of the comprehensive measures are based

on one or more green building rating systems. Renewable energy sources may also be used to meet ordinance requirements.

Table 2. RECO Conservation Elements

		Cities Using Prescriptive Measures			Cities Using Comprehensive Measures				
	Subcategories	Berkeley, CA	Roseville, CA	San Francisco County, CA	Boulder, CO	Burlington, VT	Marin County, CA	Palo Alto, CA	Rohnert Park, CA
Efficiency Technologies	Air-conditioning		Y			Y	*	Y	
	Duct Sealing	Y	Y	Y		Y	*		
	Heating		Y			Y	*	Y	
	Insulation	Y	Y	Y	Y	Y	*		Y
	Lighting Efficiency	Y		Y			*		
	Passive Solar Design		Y				*		
	Shading		Y				*		
	Ventilation		Y			Y	*	Y	
	Water Conservation Fixtures	Y	Y	Y			*	Y	
	Weatherizing	Y	Y	Y	Y	Y	*		Y
	Window Retrofit				Y	Y	*		Y
Renewable Energy Technologies	Biomass							Y	
	Daylighting				Y			Y	
	Geothermal Heat Pumps		Y		Y		Y	Y	
	Hydroelectric							Y	
	Passive Solar Space Heat				Y		Y	Y	
	Photovoltaic	Y	Y	Y	Y		Y	Y	
	Renewable Energy Fuel Cells		Y					Y	
	Solar Water Heat		Y		Y		Y	Y	
	Wind	Y	Y				Y	Y	
	Unspecified Renewable Energy Systems						Y	Y	Y

*** Unspecified Performance-Based Efficiency Technologies**

Prescriptive Measures

Three of the cities in the example cases have ordinances that employ prescriptive measures, which property owners must uniformly comply with. This type of ordinance provides a checklist of required efficiency improvements that typically include insulation, weatherizing, water conservation, and lighting efficiency. However, requirements vary according to climate zone. Areas that are subject to high temperatures for a significant portion of the year include specified requirements for air-conditioning, ventilation, and shading. Colder climate zones put more emphasis on insulation and heating systems.

Comprehensive Measures

A majority of the cities in this report use comprehensive measures. In this type of system, the cumulative energy efficiency performance of the whole dwelling is assessed to see if the home meets required standards. These standards either strictly adhere to or are based on industry rating systems such as the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) certification requirements, the GreenPoint Rating system developed by Build It Green, or the California Energy Commission's Home Energy Rating System Program (HERS). Cities and counties may allow property owners to use the rating system of their choice, some require different rating systems depending on the type of building or project under consideration, while others use a single system for all residential properties subject to RECO. In these systems, residential buildings are inspected by licensed energy auditors and rated according to a checklist of efficiency measures. Compliance inspections are carried out by either the administering city department's staff or by inspectors licensed with the city. An inspection basically consists of an energy audit, during which inspectors check whether housing elements such as insulation, ducts, and plumbing meet efficiency standards.

Comprehensive measures afford property owners the flexibility of implementing a variety of energy-saving and renewable energy technologies that can be tailored to best make their building RECO compliant. Included in Table 2 are some specific technologies that cities useing comprehensive standards will accept as a means of improving building efficiency. These are seen as options for achieving compliance rather than a set of universal requirements. Some of the compliance requirements are arranged into tiers, with different buildings falling into different categories of requirements according to factors such as housing density, size of property, the size of the building or the remodeling project, and for multi-family dwellings, the number of housing units.

Lessons Learned - RECO Conservation Elements

Prescriptive measures appear to be more commonly used in the older RECOs. The shift away from using this trigger could be because following a prescriptive checklist may not always deliver the maximum energy savings return on the investment in the required efficiency technologies. Simply having a checklist of required efficiency measures that doesn't take into consideration the specifics of each property can create unintended inefficiencies. For example, if a building has a fairly high insulation rating, increasing that rating by just a few points to meet a prescriptive measure doesn't return a great amount of savings in relation to the cost to the property owner of installing new insulation (Personal Communication with Mike Gable, 2010). Another example would be an ordinance that requires installation of an efficient furnace without requiring that the heating ducts be tested and repaired if necessary. Not only would this result in a failure to realize the full benefits of the efficient heating system, it would also increase the cost to the property owner if leaks must be sealed later.

Additionally, a prescriptive RECO design limits options to very basic measures that can be applied across the board (Interview with Chris Cone, 2010). This can become increasingly disadvantageous over time as the market for the required energy efficiency improvements is saturated and the ordinance does not evolve to meet need needs or take advantage of technological advances. The case of San Francisco's attic insulation requirements illustrates this particular disadvantage to a prescriptive RECO. San Francisco's RECO specifies minimum attic insulation requirements. In the decades since the adoption of the RECO, most of the attics in the City have been insulated. However, in portions of the city dominated by flat roofed buildings, the attics are not insulated. The low-crawl flat roofs are below the RECO and Pacific Gas & Electric (PG&E) height minimum and are therefore exempt from the insulation requirement (Interview with Cal Broomhead, 2010).

A more effective program would offer options for meeting standards in an integrated fashion, based on building science principles. In the words of Chris Cone, Implementation Manager at Climate Protection Campaign, this would require a

"…whole-house performance approach that sees a house as a set of systems that impact each other" (Interview with Chris Cone, 2010). In this way, cost efficiency and energy efficiency would be improved as a package.

For example, the city of Berkeley, which enacted the first RECO in the country, uses a prescriptive measure but is in the process of altering that due to the inefficiencies inherent in this method. The City is currently designing a proposal for comprehensive model where each efficiency improvement is assessed for its potential to make a return on the investment. Due to push-back from members of the energy commission who want to hold onto the prescriptive measure, the checklist will still be included in the RECO, but the proposed revision would only require the improvements that can be calculated as producing a positive impact to be completed. The basic retrofit component of the proposal is still being defined. Mandating a basic retrofit requirement is challenging because the need for and cost of efficiency retrofits vary from building to building. The proposed revision is a compromise between a prescriptive and a comprehensive model. While a prescriptive checklist will still be included in the RECO, the revised ordinance will be performance based. The need for efficiency improvements and the verification of their effectiveness will be verified through testing, for example, inspecting HVAC system seals for air leaks (Interview with Billi Romain, 2010).

Included in Berkeley's revision proposal is a plan to improve the database. This will help to appease the real estate community by reducing some of the potential RECO-related delays to closing home sales. Currently, if a sale is closed outside of the city it is hard to cross-reference the RECO status of homes that have been sold. Escrow offices outside of the city may not be aware of the Berkeley RECO requirements, and a late discovery of non-compliance by the realtor can hold up a sale at the last minute. While the city currently has a computerized database of homes sold, it only consists of a spreadsheet of residential properties. This database doesn't facilitate any analysis, track RECO triggers, or track the outcomes of the RECO compliance process. The proposed revision includes a plan to give property owners online access to the RECO status of their building. People

would be able to look up their buildings and the potential property improvements that would help them achieve RECO compliance (Interview with Billi Romain, 2010).

RECO Triggers

Typical triggers for RECO compliance are the construction, sale, or remodeling of a building (Zucker, 2004). Another option is a deadline by which all properties within the local jurisdiction must achieve a certain level of energy efficiency. This approach, called a "date-certain trigger" can be logistically problematic and is politically unpopular with voters when coupled with a mandatory measure (Interview with Karen Kho, 2010). My research only identified one RECO that used the date-certain method; it is not included in the example cases. This approach is generally more associated with voluntary city or countywide campaigns to increase the energy and water efficiency of the building stock. RECOS that are intended to increase the efficiency of rental housing stock can be triggered by tenant complaint.

Table 3 RECO Triggers

		Cities Using Prescriptive Measures			Cities Using Comprehensive Measures				
		Berkeley, CA	Roseville, CA	San Francisco County, CA	Boulder, CO	Burlington, VT	Marin County, CA	Palo Alto, CA	Rohnert Park, CA
Triggers	Addition, Remodel or Renovation Permit	Y	Y	Y	Y		Y	Y	Y
	New Building Permit Application		Y		Y		Y	Y	Y
	Time-of-sale	Y	Y	Y		Y			
	Metering conversion			Y					
	Tenant Complaint					Y			

The most common RECO trigger among the example cases is the application of a permit to remodel, renovate, or build an addition to a structure. Both cities using the prescriptive and those using the comprehensive model rely on this condition as a trigger for an energy and water efficiency inspection. Cities with comprehensive measures use permit applications for new building construction and applications for remodeling as a RECO trigger with equal frequency. The final permit approval is conditional on passing inspection.

The combination of a time-of-sale trigger with prescriptive efficiency requirements is a design that is most common with the older RECOs. All of the case cities that employ this approach have ordinances that were established prior to 1990. All of the prescriptive measures in the example cases are triggered by the sale of a property or the application for a permit to remodel, renovate, or build an addition to an existing structure. Unique among the cities using prescriptive measures is San Francisco's metering conversion trigger for RECO. Here the RECO comes into effect when one or more units in a multi-family dwelling is taken off of the master electric meter and hooked up to an individual meter (City of San Francisco Housing Code Chapter 12).

Burlington's ordinance differs from all of the others because the RECO only applies to rental properties. This is why it is the only city with a RECO that has a "tenant complaint" trigger; this ordinance is also brought into effect by the sale of a rental property (Burlington Code of Ordinances Chapter 18). This RECO was enacted specifically to improve the energy efficiency of rental units. As this city is in a cold climate zone, the ordinance focuses on elements that will reduce heating-related energy outlays. Burlington's RECO is intended to benefit both landlords and tenants by improving building performance in a climate where snow and ice can cause structural damage and low temperatures result in high heating expenses (Suozzo *et al*., 1997).

Lessons Learned - Triggers

Judging by the example cases, the time-of-sale trigger seems to have declined in popularity in recent years. This is most likely due to both practical and political considerations. The time-of-sale RECO trigger spurs political opposition from realtors because they feel that are put in a position where they are the default enforcers of the ordinance among their client base (Interview with Karen Kho, 2010). Realtors believe that injecting the RECO process into a real estate sales transaction is awkward. This is because each property must be individually assessed in order to formulate a plan to bring the building up to code in a way that maximizes results through a judicious combination of resources. Such an endeavor takes longer than the average sales process (Interview with Chris Cone, 2010).

A possible mitigation to the obstacle posed by realtors was suggested to me by Billi Romain, Sustainability Coordinator at the City of Berkeley's Planning Department, while discussing the proposed revision of the Berkeley RECO. Currently, when selling a property, sellers can transfer RECO compliance responsibilities to buyers, who must complete efficiency improvements within a year of the sale. This can only be done a single time. Once a property has been sold with the transfer of responsibility, the new owner cannot turn the property around and file a form to transfer RECO compliance responsibilities to the next owner. The proposed revision includes an option to allow for multiple transfers of responsibility. This would ease the burden of public education that realtors currently perceive to have fallen on their shoulders. While this may be seen as a weakening of the ordinance, it should be viewed in light of the updated computer system that will perform tracking and periodically send out automatic reminders to property owners prompting them to complete efficiency improvements. The knowledge that compliance is required within one year, coupled with the currently available financing and rebates should serve as a positive motivation for property owners to complete efficiency improvements.

Energy and Climate Programs Manager at the City of San Francisco, Cal Broomhead, offered a different approach to the political opposition posed by the realtors' associations.

Prior to the adoption of a RECO, members of this stakeholder group could be brought in as partners and given green certifications in return for helping the City market high-efficiency technologies and practices to their clients. The green certification would give realtors the advantage of a new way to distinguish themselves in the market. Participating realtors could see the value in this because buildings with high-efficiency features fetch higher selling prices. Realtors could build relations with former clients by keeping clients updated on residential resource conservation information with newsletters and flyers. Once realtors have bought into the idea of the value of green homes, City staff may have a better chance of gaining their support for a time-of-sale RECO trigger. The concept could be framed in terms of expanding the green building market and fulfilling people's right to have information on residential energy efficiency and to avail themselves of the benefits inherent in RECO upgrades when selling or buying a property (Interview with Cal Broomhead, 2010).

The more recently enacted RECOs in the example cases do not employ the time-of-sale RECO trigger. The new building and remodel permit triggers are more popular with cities and counties that adopted RECOs after 2000. This approach faces less political opposition from realtors and voters (Interview with Cal Broomhead, 2010). It is also easier to disseminate information about the program. Property owners can receive RECO information packets at the time that they apply for permits. Additionally, the contractors, who are largely responsible for the necessary construction work, are a relatively small audience. It doesn't take long before all the contractors, who represent a limited pool of people in a particular area, are educated about the ordinance requirements. Thus, cities can maintain more rigorous control of contractors than other groups such as realtors or homeowners (Interview with Karen Kho, 2010).

As previously mentioned, the date-certain trigger is not generally used to activate mandatory building efficiency measures. When tried in the past, this approach proved to be problematic, because the local infrastructure was unable to meet the demand created by the rush of property owners who waited until the last minute to complete efficiency improvements. This problem occurred in Madison, WI in the 1980s with the result that

when city residents were scrambling to complete energy upgrades, the existing supply of licensed contractors was insufficient for the sudden spike in demand. In this instance, fraudulent companies from the surrounding five-state-area took advantage of the situation, swindling property owners by charging for incomplete work. For example, some homeowners thought they had paid to have insulation installed in their homes when in fact, bags of uninstalled insulation were simply left in attics (Interview with Cal Broomhead, 2010).

The above example shows that the date-certain trigger makes quality control challenging. If a city or county were to adopt this type of RECO trigger, a more sustainable model would be to phase-in date-certain upgrade requirements according to building age, or geographically, by region. In this way, businesses can incorporate RECO mandated upgrades into a business model that will last ten to twenty years. By gradually phasing in a building efficiency program, the city or county enacting the RECO can build a market and develop a quality assurance program (Interview with Cal Broomhead, 2010).

Setting a target date has one advantage over other approaches that may make it an option deserving of serious consideration. Due to the hectic nature of most people's lives, getting people to actually perform energy upgrades can become a very complex calculation. People's living spaces are disrupted during the retrofit process, and this causes a good deal of procrastination. Property owners generally have to be pushed into completing efficiency improvements (Interview with Cal Broomhead, 2010). If mandatory upgrades were spatially and temporally staggered, the date-certain trigger could be an effective means of achieving the retrofit of a large portion of the existing housing stock.

RECO Enforcement and Tracking

Procedures for RECO enforcement are specified in the text of each ordinance. All of the cases included in this report require an inspection for compliance verification. Inspections are performed by city staff or city-licensed inspectors. The inspector either verifies that the building meets required standards or directs the property owners to perform efficiency upgrades (Suozzo *et al*., 1997). Property owners that remain in

violation of RECO requirements after the time of the final inspection face a variety of penalties. The most common consequence of failure to meet ordinance standards is a fine. Some cities issue civil penalties.

Table 4. RECO Implementation Considerations

	Subcategories	Berkeley, CA	Boulder, CO	Burlington, VT	Marin County, CA	Palo Alto, CA	Rohnert Park, CA	Roseville, CA	San Francisco County, CA
Enforcement	Plan Check at Permit Stage	Y	Y		Y	Y	Y		Y
	Final Inspection Verification	Y	Y	Y	Y	Y	Y	Y	Y
Violation Penalties	Civil Penalty			Y			Y		
	Fine	Y		Y			Y		Y
	Infraction	Y						Y	
	Order of Abatement								Y
	Permit Denial		Y		Y		Y		
	Stop Order						Y		
Effectiveness		15% Decrease in Energy Use		64,700 Tons CO_2 Emissions Reduction		> 200 Tons CO_2 Emissions Reduction			15% Decrease in Energy Use

* Info not available

With the exception of Roseville, all of the cities that use any type of construction permit as a RECO trigger require an evaluation of the project for ordinance compliance at the time of the permit application. The most common penalty for non-compliant projects issued by cities using this type of trigger is a denial of the requested permit. Rohnert Park issues a stop order and San Francisco issues an order of abatement. Some cities offer online self-administered energy audits that can be taken by property owners who wish to plan and perform their own efficiency upgrades.

Lessons Learned –Enforcement and Tracking

All of the literature on the subject of residential energy savings programs states the importance of tracking the impacts of the installed improvements. However, limited data are available for evaluation. The cities that published percentages of reduced energy use or amounts of emissions reductions did not explain how their figures were calculated.

The city of Berkeley has maintained a database for tracking RECO-related activity since the 1980's. As previously mentioned, the proposed revision of Berkeley's RECO includes a plan to upgrade the existing database. This new system would track RECO

compliance and automatically generate reminder letters to be sent to property owners until efficiency upgrades were completed. The proposal also includes plans for an internal electronic database, to allow city staff to check on individual properties' RECO status. This would give the City the means to start tracking outcomes (Interview with Billi Romain, 2010).

When the City of San Francisco adopted a RECO, records were not kept on an electronic database. Attempting to create a database now would be a formidable proposition because the City lacks the staff to do the data entry necessary for updating RECO information from a paper trail into a computerized system. This has made quality assurance and outcomes tracking challenging. When verifying the RECO status of a building in the records, the only information available in the file is whether the property is checked off. No information on efficiency inspection results or who completed the retrofit is recorded. In order to find such information, one would have to check each paper file to see who signed off on the document and ask that person what was done. This presents an unfeasible workload for city staff (Interview with Cal Broomhead, 2010).

RECO enforcement is a major challenge for cities and counties. In most cases, after the final inspection there is no follow up. The city of Roseville does not verify that required efficiency improvements have been completed. Some experts in the environmental field claim that even the long-established RECOs are not very strongly enforced (Interview with Karen Kho, 2010 and Personal Communication with Mike Gable, 2010). Half of the example cases levy fines for RECO violations, most cities and counties impose some sort of civil penalty for non-compliance. Criminal penalties are not a practical choice for enforcement due to the high administrative costs associated with this option (Interview with Billi Romain, 2010).

With time-of-sale triggered RECOs, enforcement necessarily involves the County Recorder's office. RECO compliance comes up when housing deeds are being recorded. RECO compliance is supposed to be verified prior to closing a property sale, however

this may not be done until several weeks after a sale is closed. In situations where the Recorder's Office is instrumental in RECO enforcement, counties have a definite advantage over cities. For example, the City of San Francisco's ordinance applies to both the City and County of San Francisco, so it is a simple matter for city planning staff to check compliance with the Recorder's Office because the county seat is located in the city. City and County personnel maintain close working relationships. However, in the case of a city like Berkeley, the Alameda County recorder's office is a separate entity located in a different city, and it is not as easy for city staff to check up on RECO enforcement (Interview with Cal Broomhead, 2010).

A further challenge to enforcement is agency capture. Relationships of dependency can develop between agencies and the sectors that they are responsible for regulating. This can degrade the stringency of the enforcement process. For example, realtors can develop relationships with certain inspectors who are known to have less stringent standards than others.

One city official suggests ways to circumvent these problems. He recommends instituting an accreditation program for residences. The program would have a labeling system for home energy and water conservation performance. The labeling system would require periodic home performance tests. Using third-party home performance inspectors to monitor the buildings would avoid the problem of agency capture (Interview with Cal Broomhead, 2010).

An official at the city of Berkeley had similar suggestions in relation to the proposed revision of her city's RECO. Currently, any qualified HERS 2 rater can perform RECO inspections. According to this official, the HERS 2 rating system is not well vetted and the RECO compliance process would be streamlined by the use of a standardized national rating system. Quality control can be ensured by using a national rating system and employing inspectors licensed with a state agency and registered with the city. This is because a certain number of jobs are checked by the state agency, and the city can conduct random quality assurance checks on inspectors. This would also help to avoid

agency capture. Additionally, inspections by state agency inspectors would not be as expensive as full-blown HERS 2 inspections, which can cost up to $700 (Interview with Billi Romain, 2010).

The RECO requirements in the revision would be funded by rebates from the Energy Efficiency Block Grant, Homestar funding, and county financing. It is expected that 25-30 % of properties would be reached by the ordinance within ten years. It is hoped that the combination of voluntary county-wide measures, the RECO, and currently available rebates will encourage property owners to retrofit buildings now. In this way Berkeley hopes to transform the market. This is seen not just as the promotion of green buildings but also of green jobs with a living wage.

BARRIERS TO ADOPTION

Industry research has identified several major barriers to the widespread adoption of residential resource conservation practices by property owners. Among these are: lack of information or awareness, high out-of-pocket costs, inadequate access to capital, and split incentives (Institute for Sustainable Communities, 2009). One of the most significant obstacles policy makers encounter when attempting to implement energy efficiency policy initiatives is political opposition from stakeholder groups.

Lack of Information or Awareness

Property owners are generally unaware of the energy efficiency performance of their buildings. This speaks to the need for a standardized building efficiency rating system (Institute for Sustainable Communities, 2009). Including a home energy audit requirement in the design of a RECO would give property owners valuable information on the status of their building.

However, simply identifying what areas to target is not enough; building owners need to know what efficiency measures will return the most savings for their investment (Institute for Sustainable Communities, 2009). Ensuring that the information available to decision

makers is clear and easily grasped without a lot of technical understanding is a key step in overcoming this barrier. Making information about available efficiency technologies, service providers, and sources of financing easily accessible to the end user in a single location increases the likelihood that people will invest in efficiency improvements (Interview with Chris Cone, 2010).

Widely disseminating information about home energy audits and the resources available to property owners would require a broad public education campaign. Utilizing local media outlets to spread the word can reach many segments of the population. However, low-income communities require a more hands-on approach. Industry research suggests that setting up energy efficiency centers in the target low-income communities increases the likelihood that of participation by this segment of the population (Institute for Sustainable Communities, 2009). The services offered would need to be specifically tailored to the needs of the particular population and be based on government and utility assistance programs than would not create out-of-pocket any costs for the end-user.

A recent instance of effective face-to-face community outreach can be drawn from the city of Sebastopol. While this city does not have a RECO, it can still serve as a useful example. The city of Sebastopol is involved in a voluntary Sonoma County efficiency retrofit campaign attempting to achieve the retrofit of 80% of the building stock by 2015. In order to get the word out about this goal, volunteers walked the entire city and delivered information packets to every building, both commercial and rental. The information packets included utility rebate coupons, CLF vouchers, and information about energy efficiency and the retrofit plan. While Hayward has a population about twice the size of Sebastopol's, this strategy could be modified to reach important targets or segments of the population that are less likely to be civically engaged.

High Out-of-Pocket Costs

Some cities and counties cap the amount of money the property owner must be required to spend on efficiency improvements. For remodels this can be a certain dollar amount per foot of building included in the project plan, or a percentage of the renovation cost.

Time-of-sale RECOs use a percentage of the sales tax as a cost ceiling. The figures I found ranged from 1% - 3%. The cost limit can also be a pre-determined dollar amount. Property owners are not required to undertake the projects that incur costs in excess of cost caps. Table 5 shows the various options used by the cities with published spending caps.

Table 5. Cost Limit to Property Owner

		Berkeley, CA	Burlington, VT	San Francisco County, CA
Cost Limit to Property Owner	Percent of Renovation Cost	Y		
	Percent of Sales Price	Y	Y	Y
	$ Per Square Foot	Y		
	Set Spending Cap		Y	

When evaluating options for designing a spending cap it is important to consider the particular characteristics of the housing market in the region. Depending on the prevailing trends in the local market, a percentage of the sales price of a building can represent very different dollar amounts. Table 6 compares the median home value, median household income, and cost of living index of the example cases with Hayward's statistics. As the table shows, the figures representing Hayward fall roughly in the middle of the range represented by the examples. However, Hayward falls in the lower range when compared to the nearby cities from the example cases. The dollar amount represented by a percentage of a home's selling price in San Francisco or Palo Alto represents far more money for efficiency upgrade projects than a percentage of the sales price of a typical home in Hayward would yield. Populations with lower incomes and housing values have less disposable income to use for efficiency improvements. In a lower-end market, making financing available to property owners is key to promoting adoption of efficiency technologies.

Table 6. Home Value and Household Income (Source: city-data.com)

	Median Home/ Condo Value (2008 Estimate)	Median Household Income (2008 Estimate)	Cost of Living Index Dec. 2009 (U.S. Average: 100)
Berkeley	$752,200	$64,434	181.3
Boulder	$530,100	$57,231	121.0
Burlington	$249,956	$43,127	102.0
Hayward	$439,100	$61,880	154.2
Marin	$922,600	$91,982	174.6
Palo Alto	$1,338,628	$108,020	196.1
Roseville	$381,000	$76,039	93.6
Rohnert Park	$434,206	$60,908	157.0
San Francisco	$824,300	$73,798	180.2

Inadequate Access to Capital

The initial out-of-pocket costs of efficiency upgrades is one of the most limiting factors for property owners faced with efficiency upgrade requirements (Merrian Fuller and Energy Resources Group, 2009). This is why financial incentives are the most popular mechanism for encouraging RECO compliance. Table 7 shows that six of the eight example cases offer rebate programs and five offer loans or financing. However, it should be noted that financing is not as useful for vulnerable populations in low-income groups. To address this barrier, Berkeley and San Francisco provide assistance to low-income homeowners in partnership with PG&E's CARE program.

Table 7. RECO Compliance Incentives

	Subcategories	Berkeley, CA	Boulder, CO	Burlington, VT	Marin County, CA	Palo Alto, CA	Rohnert Park, CA	Roseville, CA	San Francisco County, CA
Compliance Incentives	Expedited Permit				Y		*		Y
	Fee Waiver				Y		*		
	Height Variance						*		Y
	Loan/Financing		Y	Y		Y	*	Y	
	Low Income Assistance	Y					*		Y
	Property Tax Exclusion						*	Y	
	Rebates	Y	Y		Y	Y	*	Y	Y
	Tax Credit						*	Y	
	Technical Assistance			Y	Y		*		

Available Sources of Financing for RECO

A.B. 811

Various bills in support of AB 32 have been passed since 2006. One that helps to provide financing for RECO projects is AB 811, signed by the governor on July 21, 2008. This bill authorizes California municipalities to designate the city, county, or a portion thereof as a "contractual assessment district," an area in which private property owners may receive public financing for permanently fixed energy efficiency improvements or alternative energy installations. The financing takes the form of low-interest loans, payable twice yearly along with property taxes. The loans are land-secured and do not require credit checks or credit ratings, have a minimum of $5,000 with no maximum, and can be passed on to new owners if the property is sold (CSA, 2008).

The goal of this bill is to spur energy efficiency improvements and installations immediately by making them affordable to property owners with no initial out-of-pocket expenses. This opportunity has been underutilized due to limited knowledge of its availability. As nearly a quarter of California GHG emissions originate from buildings and their associated energy use, widespread adoption of this option would have immediate positive GHG reduction results. The benefits to communities that take advantage of this bill go beyond GHG emissions reductions. Adoption provides opportunities for economic development by employing people to carry out improvements

and has the potential to encourage an upswing in green business (Allen, 2010). These improvements also increase property values, which could lead to increased property tax revenues for local governments.

The Berkeley FIRST solar financing program is the original impetus behind AB 811. This program, adopted by the City of Berkeley in 2008, allows property owners to install solar photovoltaic (PV) systems without incurring up-front costs. Backed by the City, Berkeley FIRST provides financing to home owners who want to install PV systems. The solar energy system costs are repaid over the course of 20 years though a property tax that does not reduce home equity and can be transferred to the buyer in the event that the property is sold (Fuller *et al*, 2009). The State of California passed AB 811 to empower other municipalities to adopt similar programs following the Berkeley FIRST model. Such programs have come to be known as Property Assessed Clean Energy (PACE) financing, which has drawn national attention (pacefinancing.org, 2010). The city of Berkeley has joined a state-wide consortium working to develop a California FIRST program to deliver PACE financing to a state-wide market and increase the types of efficiency technologies eligible for funding (Berkeley FIRST, 2010).

Energy Efficient Conservation Block Grants (EECBG) Program

This federal program includes formula and competitive grants to local jurisdictions that require funding for energy efficiency and conservation projects (U.S. Department of Energy, 2009). This program is locally administered by the California Energy Commission (CEC). Small cities and counties are awarded funds to finance conservation projects of their choice. While some funds have already been committed, $10.6 million remain unallocated. The CEC is currently accepting and reviewing applications for the EECGB program (California Energy Commission, 2009).

The Energy Commission estimates that energy efficiency investments from this program can annually save consumers 61.2 million kilowatt-hours of electricity; reduce CO2 emissions by 22,541 tons, save local jurisdictions in excess of $9 million in energy costs and create or retain community jobs. (http://www.energy.ca.gov/recovery/blockgrant.html)

H.R. 1424

There are also opportunities for funding from the federal government. H.R. 1424, the Emergency Economic Stabilization Act of 2008, enacted October 3, 2008, includes renewable energy legislation that provides federal tax credits for residential solar panel installations. From January of 2009 until 2017, property owners who buy solar electric systems are eligible for a tax credit worth 30% of their solar panel purchase and installation expense. This legislation overrides a previous $2,000 limit for residential solar installations (H.R. 1424 Library of Congress, 2008).

Million Solar Roofs Program

The federal renewable energy legislation, H.R. 1424, fits nicely with California's Million Solar Roofs Program (MSRP). The goal of this program is to install 3,000 megawatts of new solar system electricity by 2017. MSRP requires public utilities to help finance incentives for solar power (CARB, 2008). However, any entity requesting solar incentives would have to adhere to energy efficiency standards addressing more aspects of the building than just the solar roofs. The MSRP is designed to help make solar energy a more attractive market by reducing costs. The cost per megawatt of solar generated electricity has been steadily declining for the past 20 years, and the addition of incentives and tax breaks makes solar an increasingly attractive option for municipalities to utilize in their emissions reduction plans (Cochran, 2008).

Rebates

A variety of rebates are available from PG&E for customers who install high-efficiency appliances and heat, ventilation, and air-conditioning (HVAC) systems, and seal the ducts in their residences. However, the incentives currently offered by PG&E for HVAC systems are not very significant when compared to the cost of purchase and installation. Consequently, the rebates alone are not a strong motivation for building owners to upgrade their HVAC systems (Interview with Cal Broomhead, 2010). The rebates for appliances represent a larger portion of the cost of purchase. Correspondingly, the PG&E rebate program is more effective at influencing consumers to buy high-efficiency appliances (Personal Communication with Sarah Rosendhal). Information on the

available PG&E rebates can be found at:
http://www.pge.com/myhome/saveenergymoney/rebates/.

Tax Credits

The American Recovery and Reinvestment Act (ARRA) of 2009 makes tax credits available to homeowners who invest in efficiency improvements. Eligible technologies are insulation, duct sealing and infiltration reduction, energy-efficient windows and skylights, high-efficiency central air conditioners and air-source heat pumps, high-efficiency gas furnaces and boilers, and high-efficiency water heaters. The tax credits are capped at $1,500, and improvements must be installed by December 31, 2010 (energystar.gov, 2010). ARRA gave a boost to PACE funding by eliminating a provision that limited the use of Investment Tax Credits for projects that subsidized energy efficiency financing (pacefinancing.org, 2010).

Split Incentives - RECO and Residential Rental Energy Efficiency

Renters generally have lower incomes than homeowners and have less control over the level of energy efficiency in their homes. Energy efficiency in rental units is a special challenge due to the problem of split incentives between landlords and renters. The typical landlord is reluctant to invest in energy efficiency improvements that will benefit their tenants through reduced utility bills while only serving to increase the out-of-pocket costs to the landlord. Renters typically do not have the financial resources or the authority to make energy efficiency improvements to their dwelling. Even those who may be able to afford the improvements and obtain permission to undertake them are disinclined to invest in improving a building that they must vacate at the landlord's discretion, possibly before they have received a return on their investment (Williams, 2008). It is also very hard for tenants to persuade landlords to make the improvements themselves, even though doing so would increase the value of their property. The power imbalance between landlord and tenant creates an inequity for renters when it comes to control over their carbon footprint. The RECO can circumvent this principal agent problem by making efficiency upgrades mandatory across the board (Zucker, 2004). There is also some benefit to the landlord in terms of increased building value due to efficiency improvements. This assertion can be borne out by the fact that even in the

current poor housing market, buildings with green features in Santa Clara and Palo Alto are some of the top draws in the area (Conrad, 2007).

Residential Rentals in San Diego

Several California cities have developed alternative ways to overcome the principal agent and split incentive obstacles to energy efficiency in rental housing. The following is an example of how one city is utilizing AB 811 funds to improve multifamily residential energy efficiency. (AB 811 is discussed above.)

The City of San Diego has adopted a Multifamily Affordable Solar Housing (MASH) program to incentivize the use of renewable energy in the form of solar photovoltaic (PV) and solar thermal water heating systems in the affordable housing market. This program is targeted towards landlords of multifamily units and non-profit housing providers that meet at least one of several "low-income residential housing" criteria. Unlike similar programs, the incentive levels for this program are not set to decline. They are divided into two tracks (California Center for Sustainable Energy, 2009).

Track 1 pays up-front fixed rebates depending on the size and expected performance of the PV system installed. An online calculator is provided for prospective uses to determine the expected performance level of the PV system under consideration. Rebates are received within thirty days of the approval and inspection of the installed PV system (California Center for Sustainable Energy, 2009).

Track 2 offers higher incentives than Track 1 for projects that create additional tenant benefits. This is a grant proposal with two application periods per year. Qualifying projects must include energy efficiency upgrades to the housing units and a reduction of costs to the tenants. They must educate tenants on energy efficiency and provide green job training or green job creation for the tenants (California Center for Sustainable Energy, 2009).

An example of a winning application is a non-profit low-income housing assistance organization's proposal to install a PV system in a 107-unit affordable housing

development. This project, approved in November of 2009, is expected to reduce individual tenants' expenses by $100 a year. The performance monitoring system that will be installed with the PV system is going to be modified in order to provide free wireless internet access to all tenants. Energy efficiency workshops will be held for the residents of the housing development. A training program will be offered to residents who wish to help install the system; participants will then be eligible for jobs in the field. Additionally, a part-time solar maintenance technician and a full-time energy efficiency educator will be hired from the tenant pool (http://energycenter.org/index.php/incentive-programs/multifamily-affordable-solar-housing/incentives).

There are several different utility providers in the San Diego area and MASH is administered by whatever provider covers the area in which the qualifying building is located.

Political Opposition

RECO policies may meet political resistance prior to adoption and implementation and are often defeated at the crucial stage of adoption by the public. In the face of political opposition, some local governments have even scrapped plans to pass RECOs prior to implementation. In other cases, the ordinance has passed only to later be repealed. Cities and counties that engage in widespread community outreach and education are the most likely to adopt and successfully implement a RECO (Suozzo, 1997). Such experiences highlight the importance of effective communication with stakeholders in order to foster a broad base of support.

Achieving Stakeholder Buy-in

In order to overcome barriers to adoption and to affect behavior, it is necessary to meet people where they are. Communication with the public must be tangible and simple. The goal of influencing public behavior can be furthered by finding a specific audience for proposals who can in turn influence the broader public. Public opinion research can inform this process.

Research in the social sciences and marketing describes the process of the diffusion and adoption of innovations, dividing populations into groups according to their place in this process (Rogers, 2003). Employing such an approach to community outreach could play a role in identifying and determining what segments of each stakeholder group it would be most productive to engage.

Analysis of industry data has found that segmenting target markets in order to understand the barriers to implementation specific to each community increases the effectiveness of energy conservation programs (Institute for Sustainable Communities, 2009). Marketing research identifies the following groups involved in the adoption of innovations, as shown in Table 8.

Table 8. Group Segmentation in the Process of Adopting Innovations **(Source: Moore, 2002)**

Innovators	Early adopters	Early Majority	Late majority	Laggards
Ahead of their time. Rarely get credit for their efforts. Generally a small group that acts as pioneers. However, innovation adoption is a collective process, and the contributions of innovators are important. (For example, in a social movement, the innovators lay the foundation on which others can base their work.	Want to be change agents. This group, while larger than the innovators, is still relatively small. These people desire a competitive edge and welcome a departure from the status quo. Early adopters expect to deal with discontinuity between the old and the new and are prepared to learn how to adapt to innovations.	Get involved when the innovation starts to take off. About one third of a given target population. Seek an improvement but wish to minimize discontinuity. Don't want a revolutionary product or innovation, but rather an evolution of current technologies or ideas that can be smoothly integrated into the status quo. Willing to make some adjustments, but wish to avoid the necessity of acquiring extensive new knowledge or technical facility. Seek "…well-established references before investing."	Wait until something is well established before adopting the innovation. Makes up about one third of the population. Do not want to have to acquire any new knowledge and won't get involved with an innovation unless there is an easily accessible support system in place	Completely uninterested in innovations.

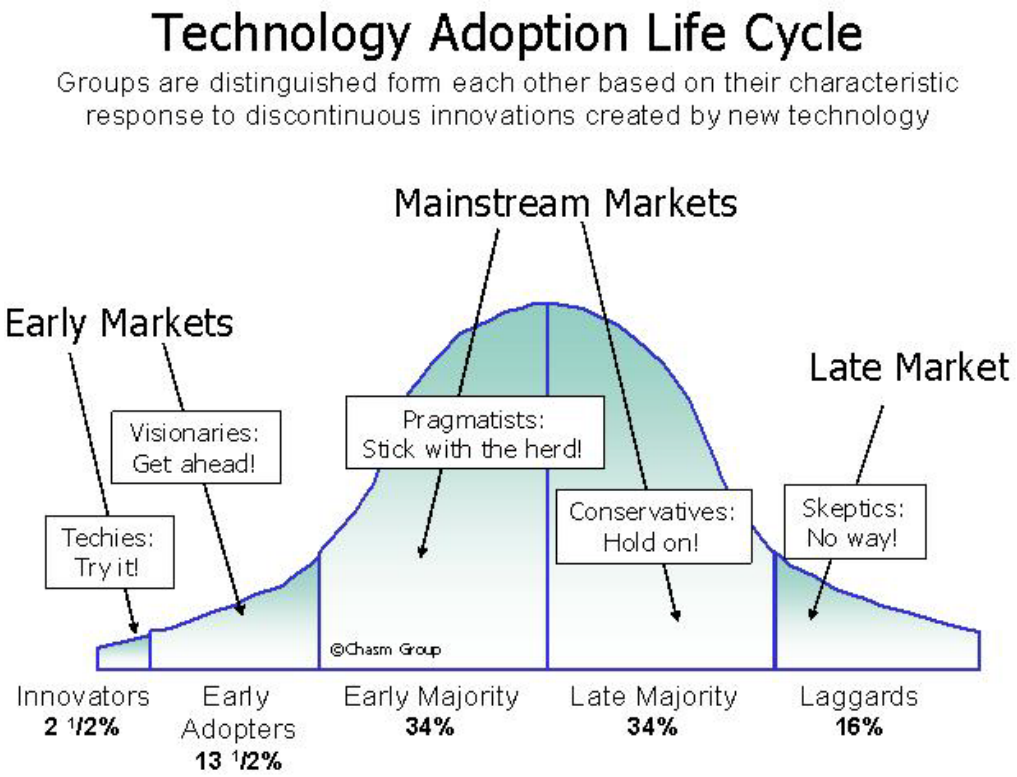

Figure 1. Technology Adoption Lifecycle (Source: Moore 2002)

Marketing research further identifies a "chasm" that must be breached when bringing an innovation from the early adopters to the larger public. This specifically refers to the gap between early adopters and the early majority (Moore, 2002). It is very challenging to bridge this gap because the early majority segment requires a suitable reference before they are sold on an idea. The reason this poses such a challenge is that the early majority generally only perceive others in the early majority to be suitable references (Rogers, 2003). Thus, promoters of innovations who target this group are operating without a reference or support base in an area that is highly reference-and support-oriented.

While sustainable building practices are widely accepted in the architectural field, risk aversion among consumers, financers, and developers is one of the main reasons why green building standards are not more widely practiced (Zucker, 2004). This can be seen in terms of the need for standard references when attempting to cross the chasm from the early adopter phase of innovation diffusion to the early majority. Another issue that acts as a barrier to more widespread adoption is the association of increased capital costs with

green building practices (Yates, 2001). This is why financial incentives are such an effective policy tool. However, the availability of financial incentives alone is not enough to tip sustainable building practices into mainstream usage.

When trying to effect change, it is important to find a specific group to target and use as a lever to influence others to support the innovation. Change agents often use opinion leaders within a particular social system as their leverage points, because opinion leaders validate the change for broader adoption by others. The trust and respect they garner from others makes their example a desirable one to follow (Rogers, 2003). This is a way to bridge the early adopter to early majority chasm.

A key to successful leveraging is to choose a group that can influence the process both upstream and downstream (Gladwell, 2002). In the example of San Francisco's RECO, the broader community was engaged in the process from the beginning of the RECO process, but contractors emerged as the effective leverage point. Half of the certification inspectors were drawn from private sector contractors. The contractors who trained as RECO inspectors were already members of the group. Presumably, some of them had reputations that were generally respected among their peers. Their endorsement of RECO would have provided the trusted reference needed to diffuse the innovation among their colleagues. The contractors had influence on San Francisco's construction and retail industry downstream and developers upstream (Zucker, 2004). This combination helped to push RECO into the mainstream as a generally accepted part of doing business.

In the current economic environment, getting the support of contractors will not be enough to create a broad base of support for Hayward's proposed RECO. The East Bay Association of Realtors ® has already stated their opposition to the consideration of a point-of-sale trigger for efficiency upgrades. Engaging realtors and all other stakeholder groups is crucial to crafting a successful RECO.

Below, options are presented for engaging the community in the design of the RECO. The criteria used to evaluate these alternatives are cost, city staff time, time to completion, access to experts, stakeholder participation, inclusion and equity for the

community, quality of feedback, and balanced feedback. For the purposes of this discussion the following monetary values are assigned to price rankings: Low - $1,000, Medium - $10,000, High - $50,000-$100,000.

- Community Meeting

This is the status quo, city staff held community meetings during the crafting of the Hayward Climate Action Plan. It is a low-cost option that requires moderate input of staff time, offers no access to experts, and can be completed within two months. Public meetings promote equity because they are open to all. As a large proportion of the city population is Latino, the provision of Spanish translators could enhance the inclusiveness of this format. Another option would be to hold some meetings in Spanish, with English translation provided. While this method holds potential for involving all the stakeholders, the quality of feedback is moderate, because in this type of public forum it is often the case that only the loudest voices are heard. Additionally, only the staff is involved in developing the ideas that are presented at the meetings; it isn't a collaborative process.

- Informal Survey

Similar to the first option, informal surveys are a low-cost option that require moderate input of staff time, offer no access to experts, and can be completed in a minimum of two months. The breadth of stakeholder participation depends on how and to whom the survey is administered. Surveys aren't inherently inclusive; the respondents are most likely self-selected. While the feedback is balanced because all respondents are answering the same questions, the quality of feedback is low due to selective response, bias, and the generally limited possibilities for narrative and interactive communication in survey responses.

- Meeting in a Box (MIAB)

This is a low-cost process that requires little expenditure of staff time and can be completed in two months. The staff sets an agenda and devises the workshop materials, which are placed in a box and disseminated to community members who agree to facilitate workshops for ten to fifteen other city residents (Enger, 1998). While there is no access to experts, the quality of stakeholder feedback is very rich and balanced with a

high potential for inclusion and equity; attendees don't have to read or speak English fluently in order to participate at a high level.

- Public Hearing

This is a low-cost option that requires moderate input of staff time, offers access to experts, and can be completed in a minimum of two months. There is potential for breadth of stakeholder participation; attendance is dependent on who is invited and able to attend. However, because public hearings are a formal procedure, this model isn't specifically designed to involve a population that isn't already comfortable with civic engagement. Feedback isn't balanced; the quality and level of feedback is weighted in favor of the experts, who are given more time and leeway than other stakeholders present at the hearings.

- Citizen Work Group

This is a low-cost option requiring moderate staff time that can offer access to experts, and may be completed in a minimum of two months. There is potential for diverse stakeholder participation. Following an expert presentation to introduce the meeting topic, citizens work together in small groups to develop a shared vision of a strategic plan for the community. This format allows for a high degree of stakeholder feedback.

The process of designing, adopting and implementing a RECO can be a long process. Each of these methods of community engagement can be utilized at different points in the development and promotion of the ordinance.

Stakeholder Buy-in – Examples

Berkeley

When the City of Berkeley initially went through the RECO adoption process, city staff held a series of stakeholder meetings. These included technical advisory meeting, as well as meetings with contractors and the real estate community. However, the stakeholder process in Berkeley is unique because of its diverse array of Commissions, made up of city staff and private citizens. Most community engagement goes on in one of the thirty-two commissions in Berkeley. In the case of the RECO-related outreach, a large part of

public involvement came in the form of community workshops held by the Energy Commission (Interview with Billi Romain, 2010).

Marin County

Marin County full involved the public in developing its RECO. Public education workshops were held in communities throughout the county to introduce the public to the concept of the RECO. Technical Advisory and Task Force Meetings, open to the public, followed the workshops. The Technical Advisory Committee has roughly fifty members drawn from the building trades, real estate community, and architectural field; as well as experts in planning, energy consultation, building performance, and building inspection. In order to forestall push-back from the realty industry, special sessions were held with this group in order to incorporate their suggestion into the ordinance. Finally, before the final adoption, public hearings were held in all the jurisdictions adopting the ordinance (Correspondence with Omar Pena, 2010).

San Francisco County

When the City of San Francisco originally enacted its RECO, PG&E was offering rebates that were hefty enough to motivate property owners to perform efficiency upgrades. Additionally, the City was running a program that provided free home energy inspections to residents. RECO compliance was leveraged with the free inspections and the PG&E rebate program. However, PG&E terminated the program in late 1980s (Interview with Cal Broomhead, 2010).

AN ADDITIONAL APPROACH TO IMPROVE ENERGY EFFICIENCY

Cities and counties adopting a RECO should be prepared to make a long-term commitment to the process of market transformation. Depending on what triggers are included in the ordinance design, it may take decades for the housing stock to be transformed. With this in mind, I have examined an additional approach to achieving residential energy efficiency, the voluntary county-wide efficiency retrofit program. The RECO and the voluntary program are not mutually exclusive. No single approach will fully saturate the market with resource efficient housing. It will take a broad spectrum of

programs to achieve the building-related GHG emissions reduction targets set by the state in the AB 32 Scoping Plan.

Voluntary Efficiency Retrofit

The Climate Protection Campaign (CPC) is a non-profit organization that that assists local governments and communities in formulating strategies for reducing GHG emissions. In Sonoma County, CPC authored a campaign to create a Community Climate Protection Plan in 2008. The intent of this plan is to meet the 2005 local government goal to reduce GHG emissions to 25% below 1990 levels by 2015. Towards this end, a voluntary county-wide program was developed to retrofit 80% of the housing stock by 2015. The CPC is working with the Sonoma County Regional Climate Protection Authority, an offshoot of the Transportation Authority, which is made up of elected officials from all the local governments in the county. The process has been vetted by a statewide taskforce that has provided expert information (Interview with Chris Cone, 2010).

The retrofit program proponents recognize the need to transform the local contracting market to reach a capacity sufficient to meet the necessary scale of the program. In order to stimulate the market, funding is being injected into the process. The first round of funding is coming from the EECBG Program and the second round of funding is from the state energy retrofit program. The county governments launched the retrofit campaign in coordination with the PG&E Prescriptive Whole House Retrofit Program (PWHRP) and the Federal Home Star Incentive Program (Interview with Chris Cone, 2010). The county will make two financing streams available to the consumer: the local government retrofit funds and the PG&E PWHRP. Information on available efficiency resources will be disseminated though Flex Your Power (FYP). FYP is a "comprehensive statewide marketing and outreach campaign" that provides information on resources for energy efficiency in California (FYP, 2010). These three resources are meant to be easily accessible and used in conjunction. Currently, the authors of the retrofit program are formulating an easily recognizable logo under which all three

resources can be easily identified and simultaneously accessed by the end-user (Interview with Chris Cone, 2010).

The retrofit program is designed as a two track system. Track 1 consists of a $1000 rebate for a basic retrofit that would cover duct sealing, insulation upgrades, a combustible equipment safety test and water heater insulation. Track 2 provides a $3500 rebate for an advanced home performance retrofit that involves analyzing building efficiency and then completing specific performance-based efficiency improvements based on the results of the analysis. The intention of this approach is to improve cost efficiency and energy efficiency as a package. For example, a property owner may not install a new furnace without also properly sealing the air ducts in order to take advantage of the full potential of the high-efficiency HVAC system (Interview with Chris Cone, 2010).

Sonoma County is partnered with all other Bay Area counties, including Alameda County, to receive shares of the $10.75 million Energy Efficient Conservation Block Grant (EECBG) funds. Both Sonoma and Alameda Counties are ahead of the curve and are promoting public demand, market transformation and workforce development. Both counties are working on different parts of the retrofit project. At a future date, all the counties will come together to share best practices and adopt measures tested by each county. Both Sonoma and Alameda Counties will have rigorous countywide programs to promote retrofitting. Proponents see this program as reaching beyond a simple GHG reduction scheme. It is being promoted as a local economic recovery program because the government has made money available to focus on green job creation and transformation to a green market that will reduce costs for residential energy consumers and increase property values (Interview with Chris Cone, 2010).

Lessons can be drawn from the deliberative and inclusive process that program proponents in Sonoma County underwent to involve stakeholders in the program design. The process was started one year ago with the formation of a committee to explore

options for GHG emissions reductions. The committee held stakeholder meetings with different groups and conducted outreach to community and neighborhood groups.

The timeline of the stakeholder outreach process illustrates a good model that Hayward could potentially utilize. In December 2009, a community event was held for consultants to introduce the program concepts, let people know what was coming, and gauge interest in the proposal. The program design process was begun In January 2010. From February through March the committee held stakeholder meetings with the following groupings of stakeholders: government and workforce, building trades and utilities, NGOs and financers, realtors and building owners. During the same time period, the committee held forums for efficiency technology vendors and contractors as well as community groups. At the time of my interview with Chris Cone the committee had yet to meet with multifamily rental tenants.

These meetings aren't market research or focus groups; they are specifically concerned with program design. The community is not being told what will be required but is actively participating in decisions. An advisory committee will fine-tune the program over time, as it's rolled out. In the next three to six months the countywide retrofit models will be developed. It is interesting to note that one of the core committee members is a realtor who kept the committee apprised of the issues important to the realtor community, thus avoiding potential contentious confrontations with the North Bay Association Of Realtors® (Interview with Chris Cone, 2010).

The lead agency for the retrofit program in Alameda County is creating retrofit standards for single-family, multifamily, and commercial buildings. They are focusing on designing systems for retrofit tracking, contractor training, contractor qualifications, GHG quantifications, and quality assurance. Detailed market analysis (phone surveys, focus groups, market targeting) and industry stakeholder meetings (with contractors, realtors, non-profit and training organizations) are currently under way. The official consumer launch will not begin until after initial contractor trainings have been held. Plans for single-family residences will be rolled out this summer, with multifamily

housing plans following a few months later. As mentioned in the discussion of the Sonoma County retrofit program, rebates will be bundled for easy access by consumers. All 14 cities in Alameda County have pooled their resources to undertake the countywide retrofit effort. The program is leveraging local funding with state and federal grants (Interview with Karen Kho, 2010).

RECOMMENDATIONS

Building on best practices from other cities' experiences with RECOs I have formulated the following recommendations for the city of Hayward.

Public Engagement

The RECO design process would be most productive if it were the result of robust public participation. Stakeholders should be involved in the design of the ordinance as much as is practical. In order to avoid push-back in the implementation process, a strong effort should be made to engage all the affected stakeholder groups from the beginning. Groups to reach out to include members of the building trades, utility providers, NGOs, financers, the real estate community, city staff, residential property owners, residential tenants, community groups, and neighborhood associations. The latter two groups can be recruited to facilitate the process of communication between citizens and the City. When engaging these groups in dialogue, avoid jargon and technical language, keeping communications clear and any visual media simple. Identifying the opinion leaders in any group will assist the city in influencing the larger group.

An effective approach could be to first notify the public of plans to develop a RECO through the mass media. This could be followed by conducting a city-wide survey to gauge the level of public knowledge and interest in residential resource conservation and identify perceived barriers to the adoption of efficiency upgrades. Using the survey results, the city could target different segments of the population for participation in stakeholder meetings.

It is important to note that "significant changes in human behavior can be brought about rapidly only if the persons who are expected to change participate in deciding what the change shall be and how it shall be made" (Verba, 1961). For this reason, stakeholder meetings may be most effective if they include a collective visioning component where small groups of diverse citizens develop a shared understanding of what would work best in their community. These work groups can then formulate strategies, comparing ideas with the larger gathering. Finally, getting participants to commit to taking personal

action will help to cement the progress made during the meetings and hopefully spread knowledge of the available innovations to their broader community. This bottom-up approach will foster a sense of ownership of the process, potentially promoting high levels of stakeholder buy-in (Sanoff, 2005).

RECO Design

RECO Triggers

Besides one problematic attempt in the 1980's, the date-certain trigger does not appear to have been attempted in the context of RECO. However, if the relevant parties favorably receive this option, it is an effective way to make sure that the entire housing stock receives efficiency upgrades. Of course, if choosing this option it is of paramount importance to gradually phase in the program so as to allow the market a chance to develop the capacity to adequately meet consumer demand.

While it is unknown what sort of RECO design will be favored by stakeholders, initial reactions from the realtors in the Hayward area indicate that a time-of-sale trigger would meet with political opposition from that group. The City may consider making a special outreach effort to positively engage this community in the design process. It may be possible to persuade this group that they stand to benefit from including this option in the RECO design.

Additional triggers the City could use are the remodel and the addition permit. These are used by most of the cities that have enacted RECOs and appear to be generally accepted, or at least tolerated, by stakeholders. All options should be left on the table in the RECO design process. The more ordinance triggers are in place, the larger the portion of the housing stock positively impacted by the RECO will be.

Comprehensive RECO

The example cases examined in this report point to the use of a comprehensive whole-house measure as an effective design for RECO conservation requirements. Such a design gives property owners the option to perform the improvements that will best fit their situation, thereby increasing the efficiency of the program. This design would entail

developing a building rating system to assess the resource-efficiency or inefficiency of each dwelling, and what improvements should be made to reduce energy and water usage levels. This option also rewards innovation, and can serve to encourage property owners to adopt the most cutting-edge efficiency technologies.

A prescriptive list could still be incorporated into a comprehensive measure, especially when used in conjunction with a home energy efficiency rating system. Rating systems generally supply a checklist of efficiency technologies that can be used to reduce residential resource consumption. However, rather than requiring each building owner to adopt identical efficiency improvements, the requirements are based on the overall efficiency performance of the dwelling. For example, if a comprehensive ordinance included a prescriptive checklist that required the installation of one-gallon-per-flush toilets but a property owner used a waterless composting toilet, the performance based evaluation of the building would recognize the water savings and the building owner would not be compelled to buy the toilet specified by the checklist.

Diffusion of Innovation

Once the ordinance has been passed, an extensive public outreach and education campaign should be undertaken in order to disseminate information about the ordinance as widely as possible. Outreach could include mailers, electronic communication, mass media, public events, and direct face-to-face contact. It should be easy for property owners to access information and resources in a one-stop-shop type of delivery system. A key factor to achieving program success is ensuring that a high proportion of property owners are aware of and understand the benefits of completing building efficiency upgrades. Such actions may increase the pool of likely RECO adopters.

A possible strategy for diffusing the adoption of the RECO measures throughout the population could be to target key decision makers. The City staff could be the first to conduct home performance tests and energy retrofits. This would give them an understanding of what an energy retrofit entails and provide firsthand knowledge of the opportunities and benefits the RECO provides. Once this group has grown comfortable

with the process and come to see it as the norm, they will be well suited to promote the adoption of a RECO and give guidance to others (Interview with Cal Broomhead, 2010).

Other local governments' experiences with RECO point to the need for an efficient computerized database to track ordinance compliance and outcomes. The database could also be used to provide easily accessible online information about RECO status, energy efficiency and locally available efficiency resources to property owners. This would be an effective delivery system for building owners to learn about what they need to do, who can do it for them, and how they may finance their efficiency retrofit.

Implementation

Enforcement is necessary for an effective RECO. The City could require an on-going inspection process for quality assurance, utilizing a home efficiency rating system. Using third-party inspectors and conducting random checks on their work could serve to keep the process honest. Permit fees can help to finance the administrative costs associated with the RECO.

Providing diverse and sustainable sources of funding would go a long way towards achieving high levels of RECO compliance among property owners. The City could apply for energy efficiency and conservation block grant funding from the federal government to help property owners finance RECO compliance projects. It would be judicious to also seek more localized sources of funding from the state, foundations, utilities, banks, and other financial institutions. Providing financing to property owners would help to overcome the barrier to adoption posed by the up-front costs of efficiency improvements. In order for the City to achieve energy efficiency in areas with minimal disposable income, low-income communities would most likely need to have upgrades completed without incurring any cost to themselves.

To be most effective, the City may consider committing to a long-term plan with incremental goals that build upon each other. This would allow time for the market transformation and workforce development necessary to achieve a sustainable change in the housing market. Sharing best practices with other cities will improve the chances for success and help to diffuse innovations throughout the market. While adopting a RECO

is an important step towards improving the energy efficiency of residential buildings, this action alone may not reach all of the existing housing stock. It would benefit the city to work with the county and state on any other residential resource conservation initiatives that are currently underway.

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