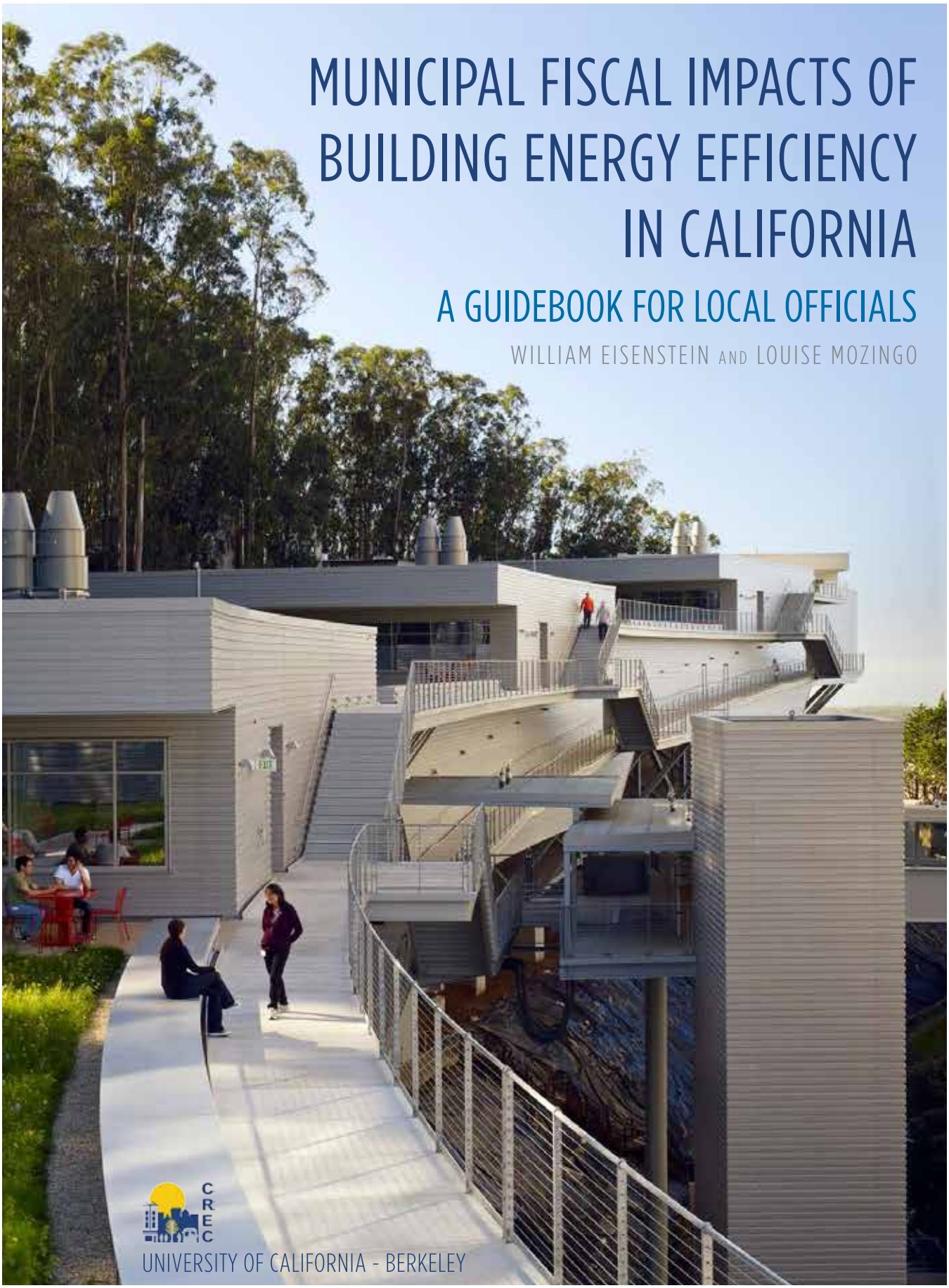
THE CENTER FOR RESOURCE EFFICIENT COMMUNITIES

MUNICIPAL FISCAL IMPACTS OF BUILDING ENERGY EFFICIENCY IN CALIFORNIA

A GUIDEBOOK FOR LOCAL OFFICIALS

WILLIAM EISENSTEIN AND LOUISE MOZINGO



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EXECUTIVE SUMMARY

This report presents the first published estimate of the fiscal impact to local government of California's natural gas-related building energy standards. Based on review of over 120 studies and interviews with over 30 industry professionals, its key findings include:

- The budgets of local governments and special districts, over time, earn back about $3.79 for every dollar that municipalities spend to enforce Title 24, Part 6 building energy standards related to natural gas – in other words, almost a 4:1 fiscal benefit-cost ratio for local government as a whole.
- Within this total, cities and counties earn back about $1.84 for every dollar that they spend to enforce Title 24, Part 6 building energy standards related to natural gas.
- These benefits to local government arise mostly from increased property tax revenues, especially for commercial property, that result from property value increases stimulated by natural gas efficiency. Other documented sources of benefits to local government budgets are increased sales tax revenues from household energy savings redirected into purchases in the local economy and from job creation, and avoided health impacts and productivity losses among local government workers.
- Other benefits not estimated in this report due to insufficient data include tax revenue enhancements from indirect job creation from redirected energy savings; tax revenue enhancements resulting from the sale of equipment and materials used in building energy efficiency improvements; avoided climate change impacts; and local governments' own direct savings from reduced energy usage in their own building stock. Inclusion of these benefits would likely push the overall fiscal benefit-cost ratio well above 4:1. In addition, this estimate includes the costs to enforce building energy efficiency standards as a whole, not just the natural gas components, making the overall net fiscal benefit estimates for natural gas more conservative than they would otherwise be.
- For any given building or set of buildings, the cost borne by local building departments for building code enforcement occurs once, but most of the benefits described above accumulate continually for decades. This is the main reason why fiscal benefits, over time, significantly outweigh fiscal costs.

There are substantial additional benefits to local property owners, the local economy, public health, and the global climate over and above these municipal fiscal benefits. But even if budgetary impacts were the only consideration, this report shows that vigorous enforcement of building energy standards is "found money" for local governments. Municipalities should re-double their enforcement efforts, and strive to remove existing barriers to higher compliance rates throughout the state, to take full advantage of these benefits.

Newport Beach Civic Center and Park. ©Arup

TABLE 1. FISCAL NET BENEFITS TO LOCAL GOVERNMENT FROM BUILDING NATURAL GAS EFFICIENCY STANDARDS

	UNITS	STATEWIDE	LARGE CITY	MEDIUM CITY	SMALL CITY	SOURCES
DEMOGRAPHICS						
Population	people	38,000,000	1,000,000	250,000	20,000	1
Local Government Employment	% work force	8.3	6.5	9.5	10	1
Residential Permits (New Construction)	units/year	136,921	3,000	1,000	75	2
Residential Permits (Additions & Alterations)	permits/year	327,863	8,628	2,157	173	3
Residential Construction Value (New + A&A)	$/year	34,487,549,855	614,018,058	228,504,515	12,280,361	2, 4
Non-Residential Construction Value (New + A&A)	$/year	24,413,163,981	580,358,382	280,358,382	210,358,382	2, 4
TITLE 24 PART 6 2013 UPDATE GENERAL BENEFITS (NATURAL GAS ONLY)						
30-Year Energy Cost Savings	$	199,161,600	5,241,095	1,310,274	104,822	5
30-Year Job Creation	jobs	1,992	52	13	1	6
30-Year Local Externality Savings	$	3,732,000	1,584,339	396,085	31,687	7
FISCAL BENEFITS TO LOCAL GOVERNMENT						
Residential Property Tax Benefit	$	38,798,494	690,770	257,068	13,815	8
Non-Residential Property Tax Benefit	$	186,760,704	4,439,742	966,498	69,670	9
Sales Tax Benefit	$	1,792,454	47,170	11,792	943	10
Job Creation Benefit	$	448,114	11,792	2,948	236	
Avoided Local Externalities Benefit	$	154,878	19,309	7,055	594	
Total	$	227,954,644	5,192,666	1,239,472	84,763	
FISCAL COSTS TO LOCAL GOVERNMENT						
Energy Code Enforcement Costs	$	60,170,500	1,462,797	415,699	32,256	11
NET FISCAL BENEFITS TO LOCAL GOVERNMENTS						
Net Fiscal Benefit to All Local Government	$	167,784,144	3,729,869	823,773	52,507	
Net Fiscal Benefit to Cities & Counties	$	50,493,361	1,062,003	187,519	9,094	
Fiscal Benefit-Cost Ratio to All Local Government	ratio	3.79	3.55	2.98	2.63	
Fiscal Benefit-Cost Ratio to Cities & Counties	ratio	1.84	1.73	1.45	1.28	

SOURCES FOR FISCAL NET BENEFITS TO LOCAL GOVERNMENT FROM BUILDING NATURAL GAS EFFICIENCY STANDARDS (FOR EACH YEAR'S COHORT OF BUILDINGS)

1 = U.S. CENSUS AND AMERICAN COMMUNITY SURVEY VIA CITY-DATA.COM
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11 = WILLIAMS ET AL (2013)

INTRODUCTION

California has long led the nation in building energy efficiency, due both to far-sighted state policy and to the diligent implementation efforts of local building officials and policymakers. These efforts have resulted in immense cumulative energy savings and avoided millions of tons of greenhouse gas (GHG) emissions since the introduction of Title 24 standards over 35 years ago. They have also created huge economic benefits, not only in reduced energy bills for homeowners, but also in economic development opportunities for local communities (Roland-Holst 2008), public health improvements, and improved resilience of local economies to energy price spikes.

As climate change and the policy responses to it both accelerate, California must build upon this successful history to further improve building energy efficiency. California's landmark climate change law, AB 32, requires that the state return to 1990 GHG emissions levels by 2020, but official state goals and international scientific consensus both call for emissions levels to be reduced 80 percent below this level by 2050. According to the California Air Resources Board (CARB), buildings are the second largest source of the state's GHG emissions. Even with dramatic emissions reductions in energy generation and many other emissions control measures, this goal is impossible to achieve without greatly improved building energy efficiency.

The California Energy Commission (CEC) and the California Public Utilities Commission (CPUC) have both declared the goal of requiring new residential construction to be zero net-energy (i.e. new residential developments must generate as much energy as they consume) by 2020 and new commercial construction to be zero net-energy by 2030 (ARB 2014). The AB 32 Scoping Plan, the state's official plan for regulating GHG emissions, incorporates these goals and seeks to achieve 26 MMT CO2e of emission reductions through green building strategies, primarily building energy efficiency, by 2020 (ARB 2008). Even with new construction achieving zero net-energy, however, improvements will also be necessary in the existing building stock through implementation of AB 758.

The Energy Commission has the authority to adopt residential and nonresidential building energy efficiency standards for newly constructed buildings, and additions and alterations, to minimize the energy consumption and environmental footprints of buildings. These standards, commonly known as Title 24, Part 6, are not directly enforced by the Energy Commission, but instead are enforced by the 530+ local building departments across the state that issue permits for, and conduct inspections of, construction activities. The achievement of the energy, cost and GHG savings anticipated by Title 24 is therefore dependent upon vigorous enforcement by local agencies.

Given this context, research providing information on the net benefits to local governments from the Title 24 standards is needed to inform future regulatory development and to ensure that present and future energy efficiency and greenhouse gas (GHG) emissions goals are achieved. This report focuses particularly on natural gas efficiency, though many findings pertain to building energy efficiency generally. Natural gas is used within buildings primarily for space heating, water heating, and cooking. It is also increasingly used to fire large power plants that generate electricity, due to recent price declines in gas supplies and the relative difficulty of building new coal-fired (or nuclear) power plants. The residential sector alone accounts for about 22% of all natural gas usage in the state, predominantly for space heating and water heating, each of which account for about 44% of total residential use. Since 1978, when Title 24 was first introduced, per-household consumption of natural gas has dropped from 848 therms to 454, a reduction of nearly 48%. Since the major Title 24 update in 1998, per-household natural gas usage in California has dropped from 609 therms to 454 therms, a decrease of more than 25%.

This report is based on extensive review of the available literature on the economic benefits of building energy efficiency, with particular focus on natural gas. Based upon this literature – over 120 studies from academia, national labs, non-governmental organizations, and

Church Hill Townhouses. Image Courtesy Danco Communities

private consultants – this report presents the first published assessment of the fiscal impact to local government of California's building energy efficiency standards. It finds that local government, over time, earns almost four dollars back for every dollar it spends to administer Title 24 Part 6 and other building energy standards. There are substantial additional benefits to local property owners, the local economy, public health, and the global climate over and above these municipal fiscal benefits. Building energy standards are implemented in order to protect public health and environmental quality, both of which are core responsibilities of state and local government. But even if fiscal balance were the only consideration, vigorous implementation of these standards would still be well worth doing from the point of view of municipal government.

In addition to the literature review and fiscal analysis, more than 30 knowledgeable professionals were interviewed to supplement these findings with real-world perspectives on the challenges, and economic effects, of building energy standards implementation. These professionals included:

- Local building officials from across California;
- Private consultants with decades of experience in building energy analysis;
- Representatives of the industries that manufacture and market furnaces, water heaters, and other gas-consuming equipment;
- Architects;
- State and regional agency staff that monitor building energy standards implementation;
- Experts from academia and national laboratories

The first section of the report brings major findings from the literature together into the first-ever estimation of fiscal net benefits to local government from building natural gas efficiency. The second section then describes the findings of the interviews detailing the challenges of achieving higher compliance with building energy standards throughout the state.

ESTIMATING FISCAL IMPACTS OF NATURAL GAS STANDARDS

A review of more than 120 studies from academia, national labs, non-governmental organizations, and private consultants discovered numerous findings that quantify positive effects from building energy standards on municipal budgets. In this section, we piece together the most relevant of these many findings to assemble the first overall estimate of the fiscal impact of building natural gas efficiency standards in California.

The fiscal benefits to local governments documented here occur for three reasons:

- The improved energy efficiency of buildings is capitalized into property values, which in turn forms the basis for property tax revenues to local government;
- Sales tax revenues increase when the money that property owners save from improved energy efficiency is redirected into other forms of spending (some of which are subject to local sales taxes that partially fund local government) and when energy efficiency-related jobs are created in local economies
- Building energy standards reduce the health and labor productivity losses associated with local natural gas combustion, and local governments benefit from this in rough proportion to the share of the local workforce employed by local government.

This estimate compares the sum of these three streams of fiscal impact against the leading estimate on the costs that local governments bear to implement building energy codes (Williams et al 2013). Crucially, while the costs to local government are only experienced one time (during the permit process), each of these three benefit streams produces continuing flows of revenues (or avoided costs) for decades. Once a property tax valuation increases, for example, the associated property tax revenues will increase not just once, but every year subsequently. Similarly, once a building is built to code, it will continue to save its owners money on energy bills in perpetuity, allowing those savings to be partially diverted into the local economy on a continuing basis. Avoided health and productivity losses also recur continually in the same manner.[1]

This estimate assumes that these benefits accrue for 30 years for each permitted building. This time interval was selected for three reasons:

- The California Energy Commission (CEC 2013) estimates energy savings from each update of Title 24 Part 6 on a 30-year time horizon;
- It is a reasonable estimate of the average length of time between property renovations large enough to require building permits and therefore trigger a new code review;
- It is a common time horizon for financing of real estate investments, especially home mortgages.

Other benefits accrue to local government budgets in addition to the three listed above, but they are difficult to estimate due to data limitations. These include:

- Indirect job creation in the supply chains of products and services purchased with the money property owners redirect from energy savings into local consumption is likely larger than the direct job creation benefits included above (Roland-Holst 2008), but can only be estimated with detailed economic modeling beyond the scope of this report;
- Local governments save money on their own building operations as energy efficiency standards improve, but new construction and major renovations in local government building stock are relatively infrequent and compiled information on the total amount of this construction is difficult to find;
- Reducing climate change impacts could avoid very large costs that local government would otherwise be forced to bear in the medium-

[1] These 30-year benefit streams are expressed in today's dollars. No discount factor or inflation factor for future benefits is used in these calculations because they are approximately the same (about 2-3% per year), and would cancel each other out.

Clif Bar Headquarters. Image Courtesy of ZGF Architects, LLP

to-long run, but because the extent and distribution of these potential costs is very uncertain and weakly linked to the actions of individual local governments today (due to the global nature of climate change), estimates of this effect are likely to be unreliable.

- Building energy standards may lead to increased sales tax revenue from the sale of certain supplies and equipment necessary for energy efficient construction, but there is insufficient sales data to assess this possibility.

This report's estimate is based only on the natural gas savings expected from the 2013 update of Title 24 Part 6. The Energy Commission produces estimates of these savings for each major construction category (single-family residential, multi-family residential, and commercial) for both new construction and renovations (a.k.a. additions and alterations) over the coming 30 years. Combined with findings from the literature and basic information about rates of construction and taxation rates, the impact of these gas savings upon municipal budgets is estimated by the methodology explained in each sub-section.

The estimates are presented in Table 1. These estimates show the balance of benefits and costs for each annual cohort of buildings permitted for construction or renovation in the state, not for the 30-year total of construction activity. These are calculated on a statewide basis, as the accumulated benefits and costs to all municipal governments throughout the state. The approximate benefits and costs for fictional municipalities of 1 million people, 250,000 people, and 20,000 people are then shown for illustration.

The key findings and calculation methods from which the estimates were generated are described further below for each of the three major benefits streams.

San Francisco skyline. Courtesy Rafael Viñoly Architects, © Bruce Damonte

PROPERTY TAX REVENUE FROM CAPITALIZED ENERGY EFFICIENCY SAVINGS

The largest fiscal benefits to local government come from the capitalization of energy efficiency savings into property values, especially in commercial properties.

KEY FINDINGS

Local governments can experience benefits from building energy efficiency through the impact on property values. Property taxes are collected at the county level, and then distributed as a shared revenue source among multiple local governments. Revenues can also be distributed to school districts, community colleges, and special districts within the county, not only cities.

While Proposition 13 constrains year-over-year property tax increases in California, property assessments are generally re-set to be equivalent to the sale price whenever a property is sold (LAO 2012). Thus, when new construction subject to Title 24 Part 6 energy efficiency standards occurs, the initial property value assessment is generally equivalent to the initial purchase price (LAO 2012), including any price premiums that may have resulted from energy efficiency standards.[2] Annual property tax payments, therefore, have the effect of these initial premiums "baked in" to each subsequent year's tax amount, even if future increases are constrained by Proposition 13. This is true for both commercial and residential properties.

With respect to commercial properties, Eicholtz et al (2010) conducted a landmark comprehensive study of every Energy Star and/or LEED-rated commercial building in the United States as of 2010 – about 10,000 buildings – and also constructed control groups of commercial buildings located within 1,300 feet of the study buildings. Using this rigorous methodology, they found that the buildings with green ratings have rental rates 3% higher per square foot than similar non-rated buildings, and that this rent premium was observed consistently. Furthermore, effective rents, which are the stated rental rate minus any concessions that the landlord must make to attract tenants, were found to be more than 7% higher per square foot, indicating robust demand for these properties.

These rent premiums translated into major property value premiums as well. Given commercial lending rates of about 6%, the effective rent premiums imply that the value of the average green-rated building in the dataset was about $5.5 million more than a comparable

[2] For renovations in which the property ownership does not change, the situation is more complicated. The previous assessment of the property is generally increased by an amount equivalent to the fair market value of the construction work, but the sum of these two is often still not reflective of the resulting fair market value.

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Fort Bragg Development. Image Courtesy Danco Communities

unrated building nearby, according to the study. Sale prices were observed to be as much as 16% higher for green rated buildings, controlling for other factors. All of these rent and value premiums were found to be larger outside of large metropolitan downtowns, in smaller and lower-cost markets.

Importantly, the study was also able to distinguish statistically the value premiums associated with the energy efficiency per se, as opposed to the marketing value of the green labeling. It found that each 10% decrease in energy consumption led to a value increase of about 1% for the building (Eicholtz et al 2010). This is significant given that the marketing value of green labeling may decline over time as more and more buildings achieve such ratings.

Wiley et al (2010) conducted a similar study of Class A office space in 46 markets around the US. They found that Energy Star properties rented for 7-8% more, and that LEED buildings rented for 15-17% more, than non-rated office space. Occupancy rates were over 10% higher in Energy Star-rated spaces and over 16% higher in LEED-rated spaces. Sale prices for Energy Star-rated buildings were $30 higher per square foot, and $129 more per square foot for LEED spaces, than in typical office buildings.

Kok et al (2012) studied the impact of green renovation on commercial rents and property values. They found that certification under the LEED rating for Existing Building Operations and Maintenance (EBOM) resulted in a 7% rent premium over control buildings, or about an extra $2 per square foot on commercial rents averaging $29 per square foot. Given commercial lending rates of 8% at the time of the study, that implies a property value premium of about $25 per square foot due to the green renovation.

With regard to residential properties, Kahn and Kok (2013) analyzed all single-family home sales in California between 2007 and 2012 and showed that homes with a green label (such as Energy Star or LEED) sold at a small premium (2-4%) over comparable, non-labeled homes. These labels were found to add more value in warmer climates of California, where cooling expenses are of higher concern to homebuyers. In areas where

TABLE 2. ESTIMATED ANNUAL DOLLAR VALUE OF ENERGY AND EMISSION REDUCTIONS OF THE 2013 ENERGY EFFICIENCY STANDARD (NATURAL GAS ONLY)

	MILLION THERMS/YR	PROPERTY OWNER $ SAVINGS/YR (IN-BUILDING USE ONLY)*
Residential newly constructed and alterations (single)	0.76	716,680
Residential newly constructed and alterations (multi)	0.18	169,740
Nonresidential newly constructed	3.70	3,489,100
Nonresidential additions and alterations	2.40	2,263,200
Total	7.04	6,638,720

(*BASED ON RETAIL NATURAL GAS PRICE OF $9.43 PER THOUSAND CUBIC FEET)

SOURCES: CEC (2013) AND HTTP://ENERGYALMANAC.CA.GOV/NATURALGAS/HISTORICAL_RESIDENTIAL_YEARLY_PRICES.HTML

TABLE 3. ANNUAL DOLLAR VALUE OF EXTERNALITIES OF NATURAL GAS USE SAVED BY TITLE 24 2013 UPDATE

	GAS-FIRED ELECTRICITY		IN-HOME USE		COMMERCIAL BUILDING USE		TOTAL	LOCAL
	$/KWH		$/1000 CU.FT.		$/1000 CU.FT.			
	NON-GHG	GHG	NON-GHG	GHG	NON-GHG	GHG		
Per house/building	0.0016	0.0050	0.3500	0.070	0.1500	0.070		
Residential newly constructed and alterations (single)	17,520	54,750	26,600	5,320			104,190	26,600
Residential newly constructed and alterations (multi)	4,720	14,750	6,300	1,260			27,030	6,300
Nonresidential newly constructed	217,840	680,750			55,500	25,900	979,990	55,500
Nonresidential additions and alterations	204,320	638,500			36,000	16,800	895,620	36,000
Total	444,400	1,388,750	32,900	6,580	91,500	42,700	2,006,830	124,400

(GHG = GREENHOUSE GAS) SOURCES: NATIONAL ACADEMY (2010) AND CEC (2013)

Ray and Dagmar Dolby Regeneration Medicine Building, UCSF. Courtesy Rafael Viñoly Architects, © Bruce Damonte

Plaza Point Development. Image Courtesy of Danco Communities

residents are concerned with being or appearing environmentally conscious (as measured by the proportion of registered hybrid vehicles), homes with green labels sell for an even higher premium. For a $400,000 home, the most conservative estimate of a 2% value increase would translate to an $8,400 premium, considerably more than the average cost of obtaining certification.

Sahadi et al (2013) also found that energy efficient homes certified as Energy Star homes are 32% less likely to default on their mortgages, and that for each point decrease in the Home Energy Rating System (HERS) Index, a nationally recognized index for measuring home energy efficiency, default risks decreased by 4%.

These rent and sale price premiums can also be assisted though local energy performance disclosure policies, such as the one in San Francisco. These policies enhance awareness among building owners and operators about the energy consumption and trends of their buildings, which may encourage them to invest in energy efficiency. Further, energy disclosure policies bring energy performance recognition to the marketplace, allowing tenants, prospective lessees, and other real estate stakeholders to factor energy performance into leasing and investment decisions. This can indirectly reward energy efficient buildings and foster additional investment in buildings that are behind the curve.

CALCULATION METHOD

According to Eicholtz et al's (2010) authoritative study, commercial properties throughout the U.S. increase in sale price by 1% for each 10% of energy savings due solely to the energy efficiency itself (as opposed to the value of a green certification). Given the CEC (2013) estimate that the Title 24, Part 6 update will result in 17% natural gas savings, this suggests a premium of 1.7% due to natural gas efficiency. Kahn and Kok (2013) found that sale prices for residential properties in California rose by up to 4% due to a green rating system, but the vast majority of this value premium is likely due to aesthetics, non-energy values associated with green certifications, and self-identification as environmentalists on the part of buyers. A conservative estimate is that only 0.25% of this value premium is due to natural gas efficiency.[3] It is plausible that this premium would be considerably lower for residential properties than for commercial, given

[3] This translates to $500 for a $200,000 house, $1,250 for a $500,000 house, or $2,500 for a $1 million house, plausible premiums for homebuyers at those price points.

Clif Bar Headquarters. Image Courtesy of ZGF Architects, LLP

that most commercial property is purchased, managed and rented by professional managers who are more likely to incorporate ongoing operating energy costs into the finances of a purchase.

In the decade from 2000 to 2010, there was an average of over $30 billion in new residential real estate and over $16 billion in new non-residential real estate permitted in California each year.[4] Because these permit activity figures are for new construction, property tax assessments will reflect the transaction price when the properties in question are first marketed and sold (LAO 2012).

Subsequent constraints on property tax assessments due to Proposition 13 do not affect these calculations for new construction, since the price premium will be "baked in" to the property tax basis at the outset. Likewise, although the large majority of properties will be resold well before they are 30 years old (Emrath 2009), the energy efficiency premium "baked in" to the initial assessment will not be lost in future re-sales because property value assessments in California lag behind fair market values due to Proposition 13. Each re-sale of the property, while not creating any new energy efficiency premium unless there is a code-compliant renovation, will nonetheless carry over the effects of the original premium because sale prices will generally be at least as high as the property value assessment under normal market conditions in California.

The situation is similar for additions and alterations. Proposition 13 requires re-assessment for "new construction" that generally matches the definition of additions and alterations that trigger Title 24, Part 6 requirements (State Board of Equalization 2010; CEC 2013b). The fair market value of the additions and alterations are added to the previous Proposition 13-defined property value assessment to calculate the new property tax basis. Hence, estimates of the total value of additions and alterations performed in the state each year are a close proxy for the sum total of this property value increase. The Construction Industry Research Board (CIRB 2013) provides such estimates for 2012, totaling about $4.33 billion for residential alterations, and about $7.80 billion for non-residential alterations.

Property tax rates are assumed to average 1.5% statewide and municipalities and special districts of local government receive virtually all of this revenue. Coleman (2006) estimates that

[4] Permit activity was averaged over the entire decade to even out the effects of the real estate boom and bust spanning the latter half of the decade.

approximately 21% of property tax revenue goes to cities, about 27% to counties, 45% to local schools, and 7% to local special districts.[5] Hence, about 48% of the revenue returns to the municipalities that enforce building energy efficiency standards.

For each annual cohort of new and renovated buildings, these property tax benefits will accumulate for 30 years to a total of almost $39 million for residential property and over $187 million for commercial property for all local government entities collectively. For cities and counties combined, 30-year benefits are over $18 million for residential property, and almost $90 million for commercial property.

SALES TAX REVENUE FROM REDIRECTED ENERGY SAVINGS

Energy efficiency standards enhance local sales tax revenues due to the redirection of money formerly spent on utility bills (not subject to local sales tax) into the local economy. In addition, studies have documented that energy efficiency standards create jobs, increasing local incomes and hence spending on taxable items in the local economy.

KEY FINDINGS

The most comprehensive studies on economic development benefits of building energy efficiency focus on programs and investments made by local governments themselves, in California and elsewhere across the country. These findings are pertinent to state-issued standards such as Title 24 as well as local programs.

Multiple studies have found that energy efficiency is a very good investment for the local economy. Certain studies focus on the "multiplier effect" of investments, which refers to the extent to which a dollar invested in a given area is recirculated in the local economy, creating additional local prosperity as it changes hands multiple times. The multiplier effects of energy efficiency investments are notably better than utility expenditures. Sanderson and Holl (2009), for instance, found the multiplier for energy efficiency to be $1.32, i.e. that each dollar invested in energy efficiency in $2.32 in local economic activity, compared to a multiplier of only $1.00 for utility bills.

A study by the National Renewable Energy Laboratory (1996), using data from Iowa, found a multiplier of $2.23 in local economic activity and redirected local spending per dollar of energy efficiency investment. This multiplier was also markedly better for energy efficiency spending than for utility bills, which only resulted in $1.66 in local benefit for each dollar spent, or for petroleum products at $1.51.

Other studies look more at job creation and leveraging of private investment into the community. The NREL study detailed an energy efficiency investment program implemented by the City of San Jose, which spent $654,350 and stimulated $8.5 million in private sector investments. This generated an initial energy savings of $4.3 million and an employment increase of 1753 job-years (NREL 1996). Imbierowicz et al (2006) found that transferring $1 million from utility spending to weatherization programs creates 16.0 additional jobs, an additional $435,000 in income to workers, and an additional $492,000 in total output on top of what was already being created by the utility spending. Transferring $1 million from utility spending to appliance efficiency programs was found to create 10.3 jobs, $329,000 in worker income, and $339,000 in total output over and above the utility spending impacts.

A study by Burr et al (2012) focusing on commercial and multifamily buildings found that each $1 million of energy savings resulted in the creation of about ten jobs. This is because the job creation effects of expenditures on capital upgrades in lighting, HVAC, water heating, appliance upgrades, environmental controls, and

[5] This estimate includes the effects of the "property tax in lieu of vehicle license fee" swap begun in 2004, which increased the proportion of property tax revenue going to cities and counties.

Ray and Dagmar Dolby Regeneration Medicine Building, UCSF. Courtesy Rafael Viñoly Architects, © Bruce Damonte

building envelope improvements significantly exceeds the job creation effects of continued spending in the utility sector. Indeed, the job creation effects of each of these industry sectors range from 11.61 jobs (for appliance upgrades) up to 16.30 jobs (envelope improvements for commercial buildings) per million dollars of investment.

The study estimates that in commercial buildings about 25% of these effects are attributable to the natural gas savings, or a net gain of about 2.5 jobs per million dollars of total energy savings, while in multifamily buildings the proportion is about 37%, or about 3.7 jobs per million dollars of total energy savings. Capital investments in water heating, which is almost entirely conducted with natural gas, were found to create 4.68 direct jobs, 4.10 indirect jobs, and 3.51 induced jobs per million dollars on investment in multifamily buildings (numbers for the commercial buildings were almost identical). This total job creation of 12.29 jobs per million dollars of investment is similar to the figures for electricity-powered building components such as lighting (12.68 jobs per million dollars of investment in multifamily buildings). Importantly, while the industries that manufacture such equipment are usually national or global in scale, the contracting firms that install such upgrades are usually local.

Roland-Holst (2008) conducted a major study of the economic impacts of household energy efficiency in California over the last 35 years in California. Through detailed modeling of the California economy, it found that employee compensation gains throughout California attributable to household energy efficiency totaled nearly $45 billion from 1972 to 2008. Much of this gain resulted from long-term indirect job creation as spending was gradually diverted from capital-intensive energy supply chains to job-intensive supply chains associated with the goods and services that households typically purchase.

CALCULATION METHOD

The Impact Analysis for California's 2013 Building Energy Efficiency Standards (CEC 2013) indicates that the state can expect 7.04 million therms per year of natural gas savings from the standards, including both residential and non-residential buildings and both new construction and additions and alterations. Table 2 shows what these annual

savings are worth at recent retail prices ($9.43 per thousand cubic feet). Extrapolating these costs over 30 years yields the energy cost savings estimate in Table 1 -- over $199 million from natural gas alone.[6] According to the State Board of Equalization (2010), 30 percent of these savings would be redirected into locally taxable spending. Local sales tax rates vary throughout California and reach as high as 10% in some municipalities, but only a fraction of this revenue goes to local governments, generally about three cents per taxable dollar spent (Coleman 2006). Thus, the redirected spending can be expected to generate about $1.79 million in sales tax revenue to local governments statewide.

The job creation benefits of energy efficiency investments were documented by Burr et al (2012) at about 10 jobs per million dollars of energy cost savings. Though local governments frequently view job creation as a core objective of policy, the effects of job creation on local government budgets are indirect. New local jobs create new salary income in the community, and a portion of that income is spent on items subject to local sales tax.

For purposes of this estimation, it is assumed that the jobs created by energy efficiency investments pay an average wage of $25/hour ($50,000 per year) and that half of these jobs are created in California (as opposed to within the manufacturing supply chain for goods and equipment, for example). Of these new California jobs, about 30% of the new income created is subject to local sales tax (State Board of Equalization 2010), and local governments receive about $0.03 in sales tax revenue per dollar of taxable spending (Coleman 2006). For any given annual cohort of buildings, job creation benefits are calculated for that year only and are not assumed to accrue continually into the future, because continuing employment in these jobs will be based on the work created by future building projects. Thus, fiscal benefit to local governments from job creation amount to about $448,000 for each annual cohort of buildings.

AVOIDED HEALTH AND PRODUCTIVITY COSTS

Combustion of natural gas both inside of building and in gas-fired power plants reduces air quality and therefore is associated with public health and labor productivity impacts. To the extent that these impacts affect local government employees –over eight percent of the workforce of California – avoiding them through improved building energy efficiency saves local governments money.

KEY FINDINGS

Energy efficiency standards can affect air quality both indoors and outdoors. The relationship between energy efficiency standards and indoor air quality is complex, because Title 24 Part 6 and other energy efficiency standards both reduce the amount of natural gas combusted within buildings (which helps indoor air quality) and generally make buildings "tighter," i.e. reduce leakage of air into and out of the building through windows, roofs, walls and doorframes (which traps combustion-related emissions inside the structure). In order to realize indoor air quality benefits, it is necessary to couple building efficiency standards with adherence to proper ventilation standards. Noris et al (2013) identified a number of building strategies that generate energy efficiency improvements as well as indoor air quality benefits, including:

- Air sealing coupled with application of energy efficient ventilation equipment
- Replacement of gas ranges with pilot lights
- Addition of thermal insulation
- Upgrading of filtration systems
- Replacement of single-pane windows with more efficient windows

They estimated based on modeling that these measures could save 17-27% of energy use in the

[6] These future savings do not need to be discounted to current-day dollars because the price of natural gas saved each year in the future will rise with inflation

homes for various locations in California, with simultaneous substantial improvements in indoor air pollution levels and thermal comfort (Noris et al 2013), though measured energy savings were smaller.

Studies in both the U.S. (Wilson et al 2013) and New Zealand (Howden-Chapman et al 2007) have shown that the health benefits of improved indoor air quality in the home include fewer doctors visits and improvements in general health, fewer instances of missed school and work, and a decline in certain chronic health conditions. Wilson et al (2013) found an 18% drop in hypertension, a 5% drop in sinusitis, and a 20% drop in the use of asthma rescue medication, as a result of a house weatherization program which included air sealing, insulation, and heating system repairs and replacements (all of which reduce natural gas use).

Howden-Chapman et al (2007) conducted a controlled experiment in New Zealand in which a randomized study group had their houses insulated to government specifications (reducing the need for natural gas heating) and were compared to a randomized control group with no insulation. The study found that in the insulated houses, a child was only half as likely to miss school, an adult was only 62% as likely to miss a day of work, and there were only 73% as many visits to the doctor, as compared with non-insulated houses. The control group houses in question were underheated and not well ventilated to the outdoors, and subsequent work showed that more effective heating and improved ventilation could also produce many important health benefits (Free et al 2010).

Logue et al (2013) have shown that natural gas cooking burners alone, if used without a ventilation hood, significantly increase concentrations of nitrogen dioxide (NO2), carbon monoxide (CO), and formaldehyde (HCHO). Older studies have documented links between NO2 levels and respiratory disease (Spengler et al 1983). Simulations indicate that, without proper ventilation, over 60% of California households cooking with natural gas at least once a week would experience levels of NO2 exceeding the state ambient air quality standards, which are designed to protect public health. NO2 is associated with increased incidence of, and even death from, asthma. These hazardous levels are reached before considering the effects of smoking

Plaza Point Development. Image Courtesy of Danco Communities

food or cooking oil, and without considering the effects of furnaces, water heaters or other natural gas combustion within the home. Other studies have shown that, among household appliances, emissions of carbon monoxide (CO) are highest for cooking stoves and tankless water heaters, and that switching from storage water heaters to tankless could significantly increase CO emissions both inside the home and in regional air basins (Singer et al 2009).

CALCULATION METHOD

The National Academy of Sciences (2010) calculated estimates for the externalities associated with energy use, including natural gas use within buildings and natural gas-fired power plants, which generate about half of the electricity in California. These externality costs, and the amounts of the externalities expected to be saved by the 2013 Title 24 Part 6 update, are shown in Table 3. These externalities are essentially the costs associated with air pollution from natural gas combustion, both in the local air basin and in the air basins of gas-fired power plants (which may be located far from place where the electricity is consumed). They include health and labor productivity impacts, estimated costs of climate change impacts, impacts on agricultural and forestry productivity, and loss of scenic values.

Only some of these impacts are experienced by the community where the energy is actually consumed. Only the non-greenhouse gas impacts associated with in-home and commercial building use are included in the fiscal impact calculations, since all the other externalities are occurring in far-flung locations. These local impacts are almost entirely associated with health and productivity losses, and it is assumed that these impact local government to the extent that the local workforce is directly employed by local government entities, about 8.3% of workers statewide.[7] It is assumed that half the cost of health and productivity losses is borne by local government as an employer (due to missed work and reduced productivity) and half is borne by the worker (due to miscellaneous health care costs). Avoiding these costs due to reduced natural gas use in the Title 24 Part 6 updates will therefore bring a little over $150,000 in benefits to local governments statewide for each annual cohort of buildings permitted in the state.

[7] While only about half the population is part of the workforce, there are also productivity losses for workers associated with illnesses among non-working children and the elderly.

FISCAL COSTS OF BUILDING ENERGY STANDARDS

Local building departments are responsible for enforcing Title 24,Part 6 by incorporating its requirements into their building permit requirements. This requires local building departments to devote extra staff time and resources to reviewing and inspecting plans and project components related to energy efficiency.

KEY FINDINGS

Williams et al (2013) performed the authoritative study of the costs of enforcing building energy codes. They found that the incremental cost to local government of enforcing energy codes (on top of other building codes) using a traditional review and inspection process ranges from about $30 to $100 per residence, and that the cost for commercial buildings ranges from as low as $180 to about $800 for common commercial buildings. More complex commercial buildings can run into the thousands. Alternative methods of enforcement, such as third-party code review or third-party inspection, can range between $200 and $400 for residential structures, but these are as yet fairly uncommon enforcement methods.

CALCULATION METHODS

For purposes of this estimation, costs were pessimistically assumed to be at the high end of the range for traditional inspection methods – $100 per residence and $1000 per commercial building. Information on the number of new residential units permitted per year in California is available and shown in Table 1; no such compiled data exists for commercial construction. The number of new commercial buildings permitted per year is assumed to be one-tenth the number of residential permits, a proportion generally consistent with estimates of the size and durability of existing U.S. building stocks in National Academy (2010).[8]

Thorough and reliable data on additions and alterations to residential and non-residential property in California are also scarce. BuildFax (2014) compiles data on residential renovation permitting activity around the country and

Fort Bragg Development. Image Courtesy Danco Communities

[8] The existing U.S. residential building stock is estimated at over 90 million structures, while the commercial stock is estimated at 5 million structures (National Academy 2010). The expected lifespan of the commercial structures is only half that of residential structures, however, indicating that they must be replaced twice as often.

found that 327,863 such permits were issued in California in 2013. Additions and alterations that change the building envelope and the heating systems are among those that trigger Title 24, Part 6 requirements related to natural gas. Based on Dohrmann et al's (2002) study of non-residential buildings, it is assumed for purposes of this estimate that 50% of these renovation permits involved work of this kind (as opposed to electricity-related items such as lighting). It is further assumed that, as with new construction, the number of commercial building renovations per year is one-tenth the number of residential. Per-permit costs to the local building department for renovation permits are assumed to be the same as those for new construction.

Overall, these components result in an estimated marginal cost to local government for energy code enforcement statewide of just over $60 million per year. This estimate includes costs to enforce both electricity and natural gas-related components of the building code since there is no practical way to disentangle them in a review and inspection process. Including the cost of enforcing energy efficiency standards as a whole, not just the natural gas components, makes the overall estimates of fiscal net benefits and fiscal benefit-cost ratios more conservative than they otherwise might be.

Compliance with building energy standards may increase initial capital costs for construction projects and renovations, but these costs are borne by property owners, not the municipality. Local government agencies that own property bear these increased construction costs for their own projects, but they are more than paid back by long-term energy savings, which are not otherwise included in these benefit estimates (CEC 2013). The additional project costs borne by private property owners are partially the basis of the job creation benefits experienced by the local economy, and thus may have a net positive impact on the municipal budget (see above). Local sales tax revenue from equipment purchasing and other increased capital expenditures in construction projects are not estimated here due to lack of data, but would also have a net positive impact on the municipal budget.

Morphosis Architecture Studio. Image courtesy of Morphosis Architects.

SIDEBAR: CLIMATE ACTION BENEFITS

Image Courtesy elpc.org

Climate change has become an important component of local government planning in California in recent years. Well over 100 local governments throughout the state have adopted specific policies or programs (including climate action plans) to combat climate change, and hundreds more are in process (Bedsworth and Hanak 2013). These planning efforts respond to, and support, the GHG targets and regulations that have been established at the state level by Governors Schwarzenegger and Brown, and by the AB 32 Scoping Plan developed by the Air Resources Board (ARB). Indeed, ARB (2008) has stated that it views local governments as an "essential partner" in combating climate change.

Local climate action plans often prominently feature building energy efficiency programs. Building energy use is the second-largest source of GHGs in the state, behind only transportation (ARB 2008). Unlike transportation patterns, which are regional in nature and therefore not under the jurisdiction of any individual municipality, building energy use can be directly influenced by local government policy. Some municipalities have so-called "reach codes" that mandate building energy performance a certain percentage beyond what Title 24 Part 6 requires, while others have programs to promote installation of rooftop solar energy or other household-scale renewable energy generation (ARB 2014).

The literature review and benefit estimates above do not include global benefits related to the avoidance of climate change impacts by the Title 24 Part 6 2013 Update or any reach codes, but these are likely to be substantial. Accumulating over 30 years as each annual building cohort's natural gas savings accumulate, these avoided externalities would total to more than $43 million at the valuation rates identified by the National Academy of Sciences (2010), not including the effects of reach codes or other additional efforts by local governments. While these benefits will be shared with the rest of the world, California will also benefit from emissions control actions taken elsewhere. Given that building energy standards return much more in fiscal benefits to local governments than they require in costs, the climate change benefits, whatever their true magnitude, can be thought of as a free benefit from the perspective of local government. In addition, these building energy efficiency efforts enable local government to meet the expectations of the state and its regulatory agencies with respect to municipal climate action planning.

THE CHALLENGES OF ENFORCEMENT

Despite the fact that building energy efficiency standards result in clear fiscal, economic, public health and environmental benefits, achieving high compliance rates[9] continues to be a challenge. To assess the challenges of implementation and identify barriers to improved compliance, the research team conducted interviews with 30 industry experts from around California, including chief building officials, consultants, equipment manufacturers, architects, state agency representatives, academics and professional association staff.

Few studies have been conducted on building energy code compliance rates in California. One study conducted on behalf of Southern California Edison found a compliance rate among commercial buildings of 62% (HMG 2009) and another for Pacific Gas and Electric found compliance among residential buildings to be 73% (Itron 2004). The experts interviewed for this report, many of whom are directly involved in code implementation in local municipalities, estimated compliance rates to be somewhere between 40 and 60 percent.

Compliance and enforcement is a multi-faceted issue. No one variable is solely responsible for low compliance rates, and no one party can be held solely accountable for lack of compliance. The interviews conducted with a diverse pool of individuals who participate in various phases of the code implementation process shared some common themes and trends: time, money, social norms, and the scale of jurisdiction all play a role. In general, compliance rates are inversely proportional to the strictness of the code, partly because more training of code reviewers, architects, contractors, trades people, energy modelers, and inspectors becomes necessary as codes strengthen. Furthermore, as energy performance goals get higher, there is less latitude for mistakes in the construction, code review, and inspection process.

The interview process focused on the non-energy benefits associated with building energy efficiency standards, especially the economic and fiscal benefits detailed in this report. Within this context, the interviewees identified both barriers to higher compliance rates (and therefore the achievement of greater non-energy benefits) and possible incentives that might improve compliance rates in the future. This is especially important given that building energy standards will continue to be strengthened significantly as the state seeks to achieve its goals for GHG emissions reductions and approaches its policy targets of zero-net-energy residential construction by 2020 and commercial construction by 2030. In each case, the interviews focused more on barriers and incentives pertinent to building departments themselves, as opposed to those experienced by property owners.

BARRIERS TO HIGHER COMPLIANCE

The interviewees identified three major barriers to higher compliance:

- Frequently changing requirements
- Low prioritization and lack of resources
- A perceived disconnect between non-energy-benefits and compliance

The following sections summarize the perspectives of the interviewees on each of these barriers.

FREQUENTLY CHANGING REQUIREMENTS

A major issue identified by interviewees is the frequency with which building energy code requirements change. As building codes are updated every few years, architects and contractors may experience difficulty integrating new practices and technologies into their projects, especially if those practices are relatively untested or otherwise innovative approaches to energy efficiency. In some cases, manufacturers may even experience difficulty upgrading certain products to meet new

[9] "Compliance rate" here refers to the percentage of properties subject to building energy codes that are fully complying with code requirements.

requirements. Since there are often only a few years between code updates, and most building professionals and suppliers operate in many different municipalities that may have additional or diverging requirements, the innovative components of energy efficiency improvements may be lost in the details of project construction as building professionals and suppliers stay in their previously-established comfort zones of practice.

Code reviewers and inspectors also have to refresh their expertise frequently as building energy codes are updated. Multiple interviewees noted that long-time inspectors are less likely to adjust easily to new standards, and that the recent recession has impeded the hiring of a new generation of inspectors potentially more amenable to frequent code changes. Radiant floor heating, which can often cut space heating energy use and costs significantly, was cited as a specific example of a technology whose implementation and maturation has been delayed due to a lack of expertise within building departments in interpreting its compatibility with building energy codes.

In addition, interviewees pointed out that as building energy standards improve reliance on performance-based compliance paths, as opposed to prescriptive compliance paths, tends to increase. This is particularly true among commercial buildings, where use of performance-based compliance paths may now be as high as 80% in many locations. Effective review of performance-based building designs requires building departments to expand their expertise

"COMPLIANCE RATES ARE ESTIMATED TO BE BETWEEN 40-60%"

in interpreting the results of energy models and building performance tests applied across a wide range of different building designs and contexts. This is much more complicated than carrying out a prescriptive code review, where compliance can be demonstrated through achievement of a checklist of building characteristics. Expanded use of performance-based compliance paths will, in general, require additional training, and potentially frequent re-training, of code reviewers.

LOW PRIORITIZATION AND LACK OF RESOURCES

Many interviewees pointed out that building departments tend to prioritize their more traditional core areas of responsibility – especially protection of health and safety – over energy performance. This is partly a matter of professional culture among building officials, and partly a matter of the highly visible negative consequences of any safety-related building failures. This unspoken prioritization of other codes over the energy code manifests in greater enforcement diligence, especially with regard to post-construction inspections. According to one interviewee, most jurisdictions routinely overlook energy code issues in post-construction inspections.

These issues are accentuated whenever there are constraints on budget and time in local building departments – if resources dictate that some aspect of a project has to receive less oversight, it will often be the energy code compliance. Lengthy plan checking processes often have financial consequences for the applicants and therefore are politically unpopular. Likewise, while many building departments finance themselves through permit fees, there are often political incentives to keep fees as low as possible, even if it means that the departments are not properly resourced to carry out thorough and timely code reviews and inspections. These issues are particularly difficult to overcome in jurisdictions with lower income populations or struggling local economies.

Some interviewees felt that increases in permit fees would not necessarily be objectionable to building professionals in many jurisdictions if levels of service also increase in ways that are visible to the industry and the public, such as better trained inspectors, more consistency among inspectors, and shorter wait times throughout code review and inspection processes. Property owners and project developers are often more concerned with saving time than saving relatively small incremental fees, especially on large projects.

Better resourcing of building departments potentially could reduce non-compliance not only at the front end of projects (by reducing the time required by code reviews) but also at the back end. Strengthened enforcement of energy code requirements in the inspection phase would reduce the temptation for contractors to cut corners on important energy-related construction details such as window sealing and insulation when a project is running over budget or behind schedule. As matters stand now, many interviewees felt that non-compliant contractors have little to fear from post-project inspections in many California municipalities. Reducing non-compliance among contractors might also help drive the equipment and materials supply distributors toward more aggressive marketing of energy efficient products.

One interviewee noted that there could also be a role for utilities in financing better energy code review and inspection as a form of energy demand management. Others felt that it would help to have at least one staff person within a building department whose responsibility is to be an energy code "champion" that can develop deeper expertise on energy-related issues in construction and exert quality control on energy code review and inspection.

PERCEIVED DISCONNECTION BETWEEN NON-ENERGY BENEFITS & COMPLIANCE

A final barrier to compliance is that many building professionals lack the conviction that the benefits of building energy codes are worth the trouble of complying with them. In general, the contractors, local government officials, and consultants interviewed voiced the belief that the non-energy benefits from energy efficiency, including economic and public health benefits, are not compelling enough to improve compliance rates.

According to one experienced contractor, it is still difficult for many in the building industry, or their clients, to recognize the connections between improving building energy performance and improving local air quality and public health. Economic and fiscal benefits are likely even more abstract for many in the building industries and

the general public. One interviewee with extensive experience with local building departments also noted that many elected officials assume that compliance rates are already nearly 100%, and therefore have trouble perceiving a need to encourage greater compliance.

One interviewee pointed out that the realization of property tax benefits for local governments may be impeded in some locations by other methods that tax assessors and mortgage financiers occassionally use to assign valuations to properties that vary from the purchase prices. Others pointed out that increased sales of certain equipment and supplies required or encouraged by building energy codes could result in additional sales tax revenue to local government, but that this benefit is difficult to estimate due to the reluctance of manufacturing and distribution industries to disclose proprietary sales data.[10]

Overall, the interviewees stressed the need for greater documentation of the non-energy benefits of building energy codes, especially job creation and other economic benefits with widespread appeal. However, some also pointed out that arguments in favor of strengthened standards and increased code enforcement should be targeted differently to different audiences; the arguments that appeal to local government officials and staff may be different than those that appeal to property owners. Some non-energy benefits such as protecting public health and addressing climate change issues may enjoy widespread "soft" support, but lack powerful local constituencies. Even elected officials in many jurisdictions know little about the specifics of building energy codes and compliance rates, much less their non-energy benefits, so these arguments should not assume too much familiarity with these issues in general.

[10] This is different than the sales tax benefits analyzed in the fiscal impact section of this report, which are due to the re-direction of money saved by property owners on utility bills into spending within the local economy. Potential increases in sales tax revenues associated with increased materials and equipment sales are not included in the fiscal impact assessment.

INCENTIVES FOR HIGHER COMPLIANCE

The interviewees also suggested several possible incentives for achieving higher compliance rates, including:

- Employing a comprehensive approach
- Better training
- Standardizing documentation
- Licensing of energy consultations
- "Selling" compliance

These are discussed below.

EMPLOYING A COMPREHENSIVE APPROACH

According to interviewees, some jurisdictions have successfully improved compliance rates by creating an all-inclusive approach that addresses compliance and enforcement of building energy standards holistically and systematically. This can involve conducting focus groups with stakeholders, addressing gaps in education about the content of building energy codes and their benefits, simplifying paperwork, and integrating across different departments of city government where necessary. These comprehensive approaches have tended to work better in smaller jurisdictions, where it is easier to establish continuing relationships and mutual understanding between building officials and contractors. Even in large jurisdictions, however, additional communication and engagement between building departments and stakeholders is likely to improve compliance. Some interviewees pointed out that this is a two-way street; contractors who communicate with the building department early in their projects to identify potential complications typically encounter fewer delays in the code review stages.

BETTER TRAINING

Interviewees repeatedly stressed the importance of reducing delays in code review processes as a means of improving compliance. In many situations, this translates into better training of available staff, whether or not budget increases or permit fee increases are politically viable to increase the number of staff. If a jurisdiction's finances prohibit extensive department-wide training on energy code review, then identifying at least one staff member as an energy code expert may suffice to improve the consistency and quality of code review. Training inspectors may be even more important to ensuring that projects actually

implement energy code provisions, as opposed to just designing them. A related idea is for local governments to contract with private firms to provide code review and/or inspections. Periodic re-competition of the contracts can ensure that the firms conducting the reviews are sufficiently expert in updated provisions of Title 24 Part 6 and other pertinent codes.

STANDARDIZING DOCUMENTATION

One interviewee suggested that standardizing energy code compliance documentation requirements across jurisdictions would improve compliance by enabling contractors to develop deep familiarity with a single standard energy code compliance process applicable to all jurisdictions, rather than needing to master several different ones. This would likely also facilitate improved communication between building departments and contractors about specific provisions of the energy code and their application in a given project. Standardization of documentation might also reduce variability in the interpretation of code provisions both between and within building departments.

LICENSING OF ENERGY CONSULTANTS

At present there is no licensing examination for the energy consultants that advise contractors and clients on their compliance with Title 24 Part 6 and any additional energy-related local code provisions. As one interviewee pointed out, without licensing there is no formal accountability or liability for consultants who misinterpret building energy codes. As with structural engineering, licensing of energy consulting would ensure that a certified professional provides stamped approval of the design plan of any given project. The content of the licensing exam and periodic re-licensing reviews would help ensure that the consultants had appropriate expertise in the provisions of the continuing periodic updates to Title 24 Part 6 and other related issues. A related suggestion of one interviewee is for the creation of a process to certify contractors as building energy code experts.

SELLING COMPLIANCE

Finally, one chief building official emphasized that improving the speed and convenience of the code review and inspection process will improve compliance more than education or adjustments to permit fees. In that sense, compliance must become seen as convenient rather than burdensome. But the changes that would enable this level of convenience generally require greater funding or political commitment on the part of local governments. That in turn requires increased understanding of the non-energy benefits that building energy codes achieve, among the public, the building industry and within local governments themselves.

CONCLUSION

California's pioneering building energy efficiency standards have generated major new energy savings, climate protection benefits, and economic benefits with each update since their original introduction in the 1970s. As this guidebook has shown, these standards also produce major fiscal benefits for local governments, the entities charged with implementing the standards. These fiscal benefits arise from increased property tax revenues from both residential and commercial properties, energy cost savings that are redirected into taxable local spending, avoidance of public health externalities for local government workers, and job creation in the local economy.

Many of these benefits, particularly the property and sales tax benefits, accrue for decades for each annual cohort of buildings constructed, but the cost to local government of applying the standards to that cohort of buildings occurs only once (during permit review). For this reason, the benefits to local governments over time substantially outweigh the costs. For natural gas-related standards alone, the benefit-cost ratio to local governments across California is estimated at almost 4:1, and the total net benefits to local governments are estimated to be well over $150 million over 30 years, for each annual cohort of buildings. Electricity-related benefits, though not examined in detail in this guidebook, would add substantially to these net benefits.

Despite these sizable benefits, Title 24 compliance rates are estimated by various sources to be only 25-73% for residential structures and 50-60% for commercial structures. According to building officials, building professionals and other experts interviewed for this guidebook, this is due to other implementation barriers such as frequently changing requirements, low prioritization of energy codes, general lack of resources within building departments, and a perceived disconnect between non-energy benefits and compliance.

Increasing compliance levels would increase the benefit streams flowing to local government. Building energy standards also bring additional economic, environmental and public health benefits over and above the fiscal benefits detailed in this report. Both elected officials and building department staff have an important role to play in securing these benefits. Based on the findings of this report, the research team recommends that local governments consider the actions below to pursue higher compliance rates in their communities.

California Academy of Sciences, Roof Garden view towards DeYoung Museum. © Cody Andresen/Arup

RECOMMENDATIONS FOR LOCAL ELECTED OFFICIALS

- Increase resource allocations for building department activities related to energy code compliance and enforcement. Higher compliance rates translate to greater benefit streams over time.
- Ensure that permit fees reflect the cost required to enforce building energy codes thoroughly, and quickly, in all projects. Multiple interviewees felt that saving time is more important than saving fee costs for many project developers.
- Consider increasing penalties for non-compliance. Only rigorous inspections, combined with real penalties for non-compliance, can ensure that projects are actually constructed (as opposed to just designed) in accordance with energy code requirements.

RECOMMENDATIONS FOR LOCAL BUILDING DEPARTMENT STAFF

- Identify at least one staff person within the building department to be an energy code "champion." This person can develop deeper expertise on energy-related issues in construction and assist with quality control on energy code review and inspection throughout the department.
- If possible, work with regional energy networks and/or utilities to enhance staff training on issues related to energy code review and inspection. Resources from outside local departments are available to improve staff capacity and expertise.
- Identify ways to streamline paperwork and, if applicable, to coordinate more efficiently between municipal departments. Visible improvements in the time and effort required for energy code compliance will help encourage higher compliance rates. Coordinating with other municipalities to harmonize required formats for drawings and energy calculations would enable contractors and consultants to comply more easily.
- Ensure that any increase in permit fees is accompanied by visible improvements in review and inspection processes. According to interviewees, shorter wait times and greater consistency between reviewers/inspectors within the department are high priority issues.
- Initiate conversations with energy utilities about financing better energy code review and inspection as a form of energy demand management and portfolio balancing. Utilities may find this to be a cost-effective investment compared to other demand management programs.
- If necessary, make the case to elected officials that building energy standards improve municipal balance sheets in the long run, and are worth extra investment in compliance and enforcement. Many elected officials assume that compliance rates are already near 100% and do not fully appreciate the fiscal benefits that would accrue from greater compliance with building energy standards.

Greater appreciation of the sizable fiscal net benefits to local governments of compliance with Title 24 and other building energy standards can help overcome some of these compliance barriers, particularly those related to funding of building departments. Greater compliance will yield greater benefits, not only to local governments, but also to the California economy, the health of California's citizens, and the global climate.

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