New Construction: Opportunities for Greenhouse Gas Emission Reduction in Sonoma County

Community Climate Action Plan

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Overview of New Construction Impacts

Between 1990 and 2000 greenhouse gas emissions in the residential, commercial and industrial buildings sectors have grown appreciably and will continue to grow if we follow a "business as usual" (BAU) approach. Therefore, to meet Sonoma's target to reduce greenhouse gas emissions 25% below 1990 levels by 2015, a change in current construction practices is required.

To achieve our emissions reduction target in these three building sectors we will have to cut emissions by 45% in the residential sector[1], 55% in the commercial sector, and 50% in the industrial sector[2] below what they would be in 2015 following a business as usual (BAU) strategy.[3] This is a 49% reduction in the combined residential, commercial, and industrial buildings sectors.

Sector	**1990**	**2000**	**2015 BAU**	**2015 Target**
		(Tons eCO_2)		
Residential	810,123	958,627	1,114,468	607,592
% Reduction from 2015 BAU to 2015 Target				-45%
Commercial	392,423	535,368	652,033	294,317
% Reduction from 2015 BAU to 2015 Target				-55%
Industrial	228,450	310,163	345,280	171,338
% Reduction from 2015 BAU to 2015 Target				-50%
Total (Resi+Comm)	**1,430,996**	**1,804,158**	**2,111,781**	**1,073,247**
				-49%

[1] 2015 BAU projections in the residential sector are based on estimates of the number of houses that will be built in Sonoma County between 2005 and 2015, multiplied by the average number of tons of emissions per household in the 2005 inventory.

[2] 2015 BAU projections in the commercial and industrial sectors are based on estimates of the number of new jobs that will be created in Sonoma County in each sector between 2005 and 2015, multiplied by the average number of tons of emissions per employee in each sector the 2005 inventory.

[3] We anticipate, however, that Title 24 policies will continue to reduce emissions (in the residential sector) below the projected 2015 BAU emissions estimates.

Expectations for New Development Through 2015

Based on projections from the Association of Bay Area Governments (ABAG), the number of households and jobs in the combined nine cities and the unincorporated areas of Sonoma County will increase by roughly 10% and 18%, respectively, by 2015.

The areas that are expected to experience the bulk of the growth in households and jobs include Santa Rosa, Rohnert Park, Petaluma and the unincorporated areas of the county.

Our survey of existing construction policies in the various Sonoma County jurisdictions indicates that Sonoma County has a relatively high number of mandatory green building policies as well as a number of well-developed voluntary programs compared to other counties in California. These policies generally conform to green building standards established by the "Build It Green" and the Bay Area's "Green Points" systems, as well as to "Leadership in Energy and Environmental Design" (LEED) certification.

Jurisdiction	**Households**			**Jobs**			**New Construction: Existing Policies**
	2005	2015	% Change	2005	2015	% Change	
Santa Rosa	60,250	66,740	10.8%	87,200	109,090	25.1%	Voluntary, Green Points system.
Rohnert Park	15,810	17,500	10.7%	17,670	22,800	29.0%	Mandatory, minimum points under Green Points, depending on size of project.
Petaluma	20,920	23,560	12.6%	32,140	36,140	12.4%	Voluntary, Green Points system.
Unincorporated	58,520	62,150	6.2%	56,460	60,150	6.5%	None yet, policy exploration underway.
Windsor	8,590	9,880	15.0%	6,080	8,670	42.6%	Mandatory under consideration, similar to Rohnert Park's.
Cotati	2,860	3,160	10.5%	2,560	3,780	47.7%	Mandatory for over 2,500 SF, Green Points system.
Healdsburg	4,430	4,970	12.2%	6,180	7,220	16.8%	Incentive, expedited permitting if LEED certified or includes PV.
Cloverdale	3,090	3,930	27.2%	1,740	2,620	50.6%	None.
Sebastopol	3,300	3,490	5.8%	5,640	6,070	7.6%	Mandatory, Green Points system.
Sonoma	4,730	5,050	6.8%	8,290	8,480	2.3%	None yet, policy exploration underway.
Total	182,500	200,430	9.8%	223,960	265,020	18.3%	

Feasibility of Policies

Before recommending policies, it is important to assess the feasibility of green building programs, especially the projected costs and savings of green building for contractors and purchasers. Looking first at costs, a sample of LEED studies (see chart below) that have documented cost premiums for green building projects shows that the costs for the minimum level of LEED certification are minimal. Costs become more significant at higher levels of certification (particularly Gold and Platinum levels), but none of the local mandatory policies require compliance with these higher standards.

There are no studies regarding the costs of the Green Points system, but the rule of thumb is 0% - 5% more. Case studies of "Zero-Energy Homes" - which are designed to achieve carbon-neutrality on an operational basis - reveal a range of initial constructions costs to comply with the design standards, as shown in the below table.

Studies Documenting Costs Premiums for Green Projects

LEED Studies	**Year**	**Certified**	**Silver**	**Gold**	**Platinum**
State of California	2003	0.66%	2.11%	1.82%	--
Davis Langdon	2004	--	1.00%	2.70%	--
General Services Administration	2005	-0.4 – 2.1%	0.0% – 4.4%	1.4 – 8.2%	--
ULI - Office Buildings	2005	0.7%	1.9%	2.2%	6.8%
BIG - Greenpoints	Rule of Thumb - Cost Premium		0% - 5%		
Zero-Energy Homes					
Tucson - Demonstration Home	2003	20% Cost premium, not including PV-system rebates.			
San Diego case study	2004	0% Increase in home price, cost increase not documented.			
Sacramento, "Premier Gardens"	2005	5% Home price premium, cost increase not documented.			
Issaquah, King County, WA	2009 (Planned)	$100,000 added cost per unit (estimated)			

Energy savings associated with the application of "green" design standards vary depending on the range of features included in the project. The following chart shows efficiency gains for the LEED and Build it Green (BIG) certification systems.

Another internal study of “Build It Green” (BIG) projects (see following chart) indicates that a 53% reduction in electricity use (kWh) and a 34% reduction in natural gas use (therms) were achieved. Rohnert Park’s Green Building Program is achieving the required 15% reduction below Title 24 standards.

Study		Savings Description			
LEED Studies	**Feature**	**Certified**	**Silver**	**Gold**	**Platinum**
ULI - Office Buildings	Efficiency	18%	30%	37%	n/a
ULI - Office Buildings	On-site energy	0%	0%	4%	n/a
Total		**18%**	**30%**	**41%**	--
BIG - Internal Study			**kWh**	**Therms**	
2,000 SF Home - Standard			8,602	489	
Reductions due to Features					
w/ Title 24 feature - Exceed by 15%			(548)	(110)	
w/ Energy Star appliances			(471)	(15)	
w/ 2.4kW PV system			(3,500)	0	
w/ Solar hot water system			0	(43)	
2,000 SF Home with all Features			**4,083**	**321**	
% Reduction in Energy Use			**53%**	**34%**	
Rohnert Park Green Building Program					
Required reduction beyond Title 24			**15%**	**15%**	

Our conclusions from the generalized results of the aforementioned studies are that the savings in energy costs will make up for green building certification improvement costs over a 10-year period.[4]

Although the purchasers generally realize the savings from reduced energy costs, while developers pay the extra costs to comply with the green building standards, there are ways for developers to recover these costs. One way is for developers to charge purchasers more money to buy the properties. There also are tools that developers can utilize to pass costs on to homebuyer, over time. One such tool that has been used is to treat the efficiency improvements to buildings like a community infrastructure cost. This involves utilizing assistance from local governments whereby a community facilities district is established and developers pay costs upfront, but purchasers pay higher property taxes, a portion of which go to developers over time. This tool is normally used in "greenfield" development projects.

Another tool that can be used locally is proposed in Berkeley's Climate Action Plan[5] where an assessment district would be established and homeowners would get efficiency improvements at no cost and pay for them over time on their property tax bills.

[4] This assumes the net present value of the properties will be positive at a 4.5% to 5% discount rate.

[5] Berkeley Climate Action Plan - www.berkeleyclimateaction.org/Content/10040/ClimateActionPlan.html

Recommendations

Based on our analysis, we recommend the following actions.

- Institute a mandatory green building regulation akin to that which is currently in place in Rohnert Park for all developers in Sonoma County. Some incentives can be built in to the regulation to allow those developers who want to exceed the requirements of the green building regulation the opportunity to built "zero-energy" homes and buildings.
- Within the new countywide green building regulation, require "inclusionary" projects for developers who build multiple buildings that make a certain number of those buildings zero-energy, such as are done with low-income housing projects.
- Review all local building codes to look for opportunities to remove existing barriers to green building projects.

Emission Reduction Potential of Policies

A rough calculation of the emissions reduction potential through 2015 reveals that if the recommended policy initiatives were instituted, Sonoma County could achieve 15% to 43% in energy use reductions from residential new development. This is based on an estimate that new residential development in a business as usual scenario (BAU), i.e., no new regulations, would result in 99,698 eCO_2 of additional emissions. If a countywide green building regulation similar to what exists in Rohnert Park were enacted, emissions could be cut by a minimum of 14,955 eCO_2 (15% below BAU). If, on the other hand, all new homes in the county were built following the GreenPoints program, emissions could be reduced by 42,870 eCO_2 (43% below BAU). These estimates are based on the following calculations.[6]

Item		Unit
1990 Residential, Comm, Industrial	1,430,996	CO_2 tons
2015 BAU Residential, Comm, Industrial	2,111,781	CO_2 tons
2005-2015 "New Construction Tons"	215,075	CO_2 tons
Residential		
Expected number of new units (2005-2015)	17,930	DUs
BAU tons per unit	5.56	CO_2 tons/Unit
Total CO_2 tons from new Residential	99,698	CO_2 tons
Min energy reduction (Rohnert Park program)	15%	
Ave. energy reduction GreenPoints	43%	
Minimum Measure Reduction	14,955	CO_2 tons
Average Measure Reduction	42,870	CO_2 tons

[6] Note: energy reduction estimates were used as a proxy for emissions reductions in the above residential and following commercial and industrial calculations.

Similarly, in the commercial buildings arena, if every new commercial building built in the county were to be built according to LEED certification requirements, energy use could be cut by 18% to 24%. This is based on an estimate that new commercial development in a business as usual scenario (BAU), i.e., no new regulations, would result in 110,912 eCO2 of additional emissions. If all new commercial buildings met the LEED certification, emissions from these new buildings could be cut by a minimum of 19,964 eCO2 (18% below BAU). If all these new commercial buildings were built in such a way as to achieve the average LEED certification reductions, emissions in the county could be cut by 26,619 eCO2 (24% below BAU). These estimates are based on the following calculations.

Item		Unit
Commercial		
Expected new employees (2005-2015)	23,808	Employees
BAU tons per employee	4.66	CO_2 tons/ Employee
Total CO_2 tons from new Commercial	110,912	CO_2 tons
LEED min.	18%	
LEED ave	24%	
Minimum Measure Reduction	19,964	CO_2 tons
Average Measure Reduction	26,619	CO_2 tons

Finally, in the industrial buildings arena, if every new industrial building built in the county were to be built according to LEED certification requirements, energy use could also be cut by 18% to 24%. This is based on an estimate that new industrial development in a business as usual scenario (BAU), i.e., no new regulations, would result in 4,465 eCO2 of additional emissions. If all new industrial buildings met the LEED certification, emissions from these new buildings could be cut by a minimum of 804 eCO2 (18% below BAU). If all these new industrial buildings were built in such a way as to achieve the average LEED certification reductions, emissions in the county could be cut by 1,072 eCO2 (24% below BAU). These estimates are based on the following calculations.[7]

[7] LEED minimum reductions in the industrial arena are based on reductions for commercial-sized buildings. Given that Sonoma County industry is largely "light industry" these commercial estimates are relatively accurate.

Item		Unit	
Industrial			
Expected new employees (2005-2015)	819	Employees	
BAU tons per employee	5.45	CO_2 tons/ Employee	
Total CO_2 tons from new Commercial	4,465	CO_2 tons	
LEED min.	18%		
LEED ave	24%		
Minimum Measure Reduction	804	CO_2 tons	
Average Measure Reduction	1,072	CO_2 tons	
Res+Comm+ Indu Minimum Measure Reduction	**35,723**	**CO_2 tons**	**17%**
Resi+Comm+Indu Average Measure Reduction	**70,561**	**CO_2 tons**	**33%**

The sum total of reductions that could be achieved in Sonoma County from emissions due to new development in the combined residential, commercial and industrial arenas if the recommended new green building policies were instituted could be 17% to 33% (35,723 eCO2 tons and 70,561 eCO2 tons, respectively), below emissions from business as usual (BAU) new development.[8]

[8] Sources for the calculations in the above tables are:

- Build It Green – Internal Report on Average CO2 reductions in GreenPoints homes
- LEED Studies: percent efficiency by LEED Certification Level
- ABAG projections 2007 (population, households, jobs)