Energy & Environmental Solutions

Energy Analysis for Window Films Applications in New and Existing Homes and Offices©

PREPARED FOR:
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Description of Variables

The homes were simulated in four key climate zones of the sixteen climate zones recognized in California for the purposes of code requirements. The climate zones were chosen in order to get a range of conditions and represent areas with greater building numbers. These were the mild climate of the Northern California Bay Area (CZ4), the coastal climate zone of San Diego (CZ7), the inland climate zone of Riverside (CZ10) and the Central Valley climate zone of Sacramento (CZ12). These climate zones are representative of the areas where most homes are built in the state. Climate Zones 10 and 12 represent locations with high cooling loads where window film should have a substantial impact on energy use.

The office buildings were simulated in a different set of climate zones, based off of volume of existing and new commercial construction. The representative cities for these climate zones are Oakland (CZ3), San Diego (CZ7), Pasadena (CZ9), and Fresno (CZ13).

Using data from manufacturers and the National Fenestration Rating Council (NFRC) Certified Products Directory, the window films on the market were characterized into three groups, “good”, “better” and “best” options, and a rounded median value chosen for solar heat gain coefficient (SHGC) and U-factor. The values used are detailed in Table 1, shown below. For the office building model, the visible transmittance is also modeled for the purposes of evaluating daylighting design, which is not modeled in

	without	good	better	Best	better(u)	best(u)
Single	0.71	0.45	~~0.35~~			

weighted more heavily than energy used at night (off peak). TDV energy emphasizes the impact of energy features that reduce peak load (primarily air conditioning load). This is beneficial for window film savings, since the energy saved is typically space cooling energy which occurs during the peak period.

For commercial applications, the return on investment (ROI) is the deciding factor in implementing an energy measure. The results presented here are the return on investment for the application of the

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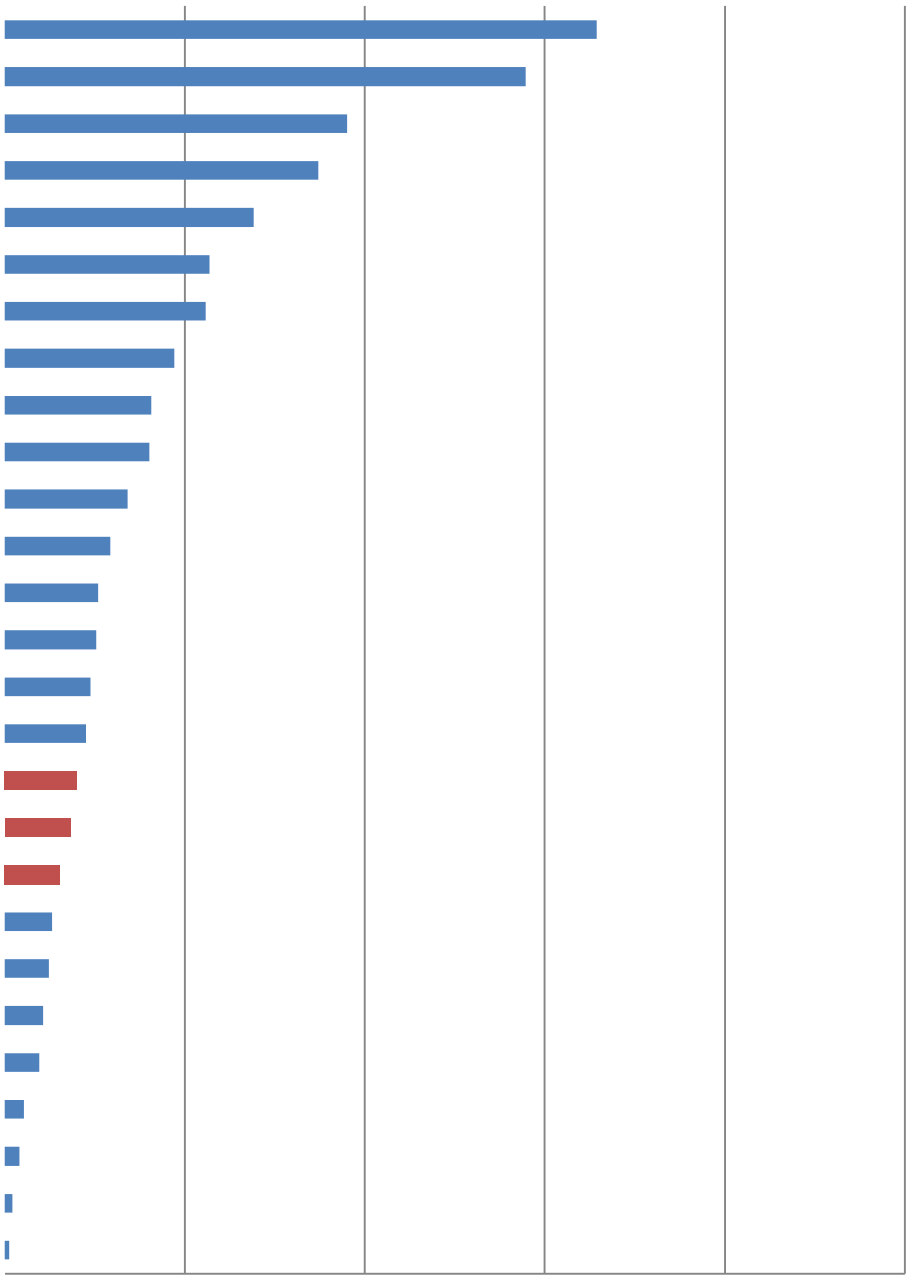
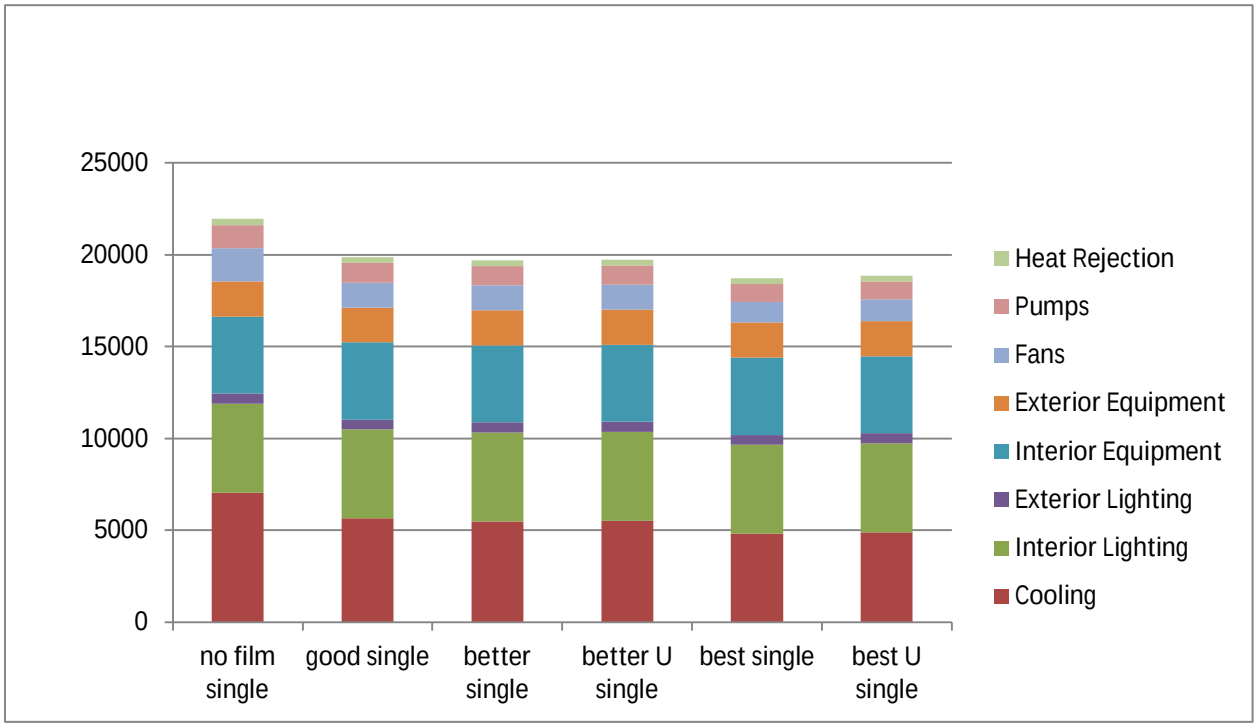
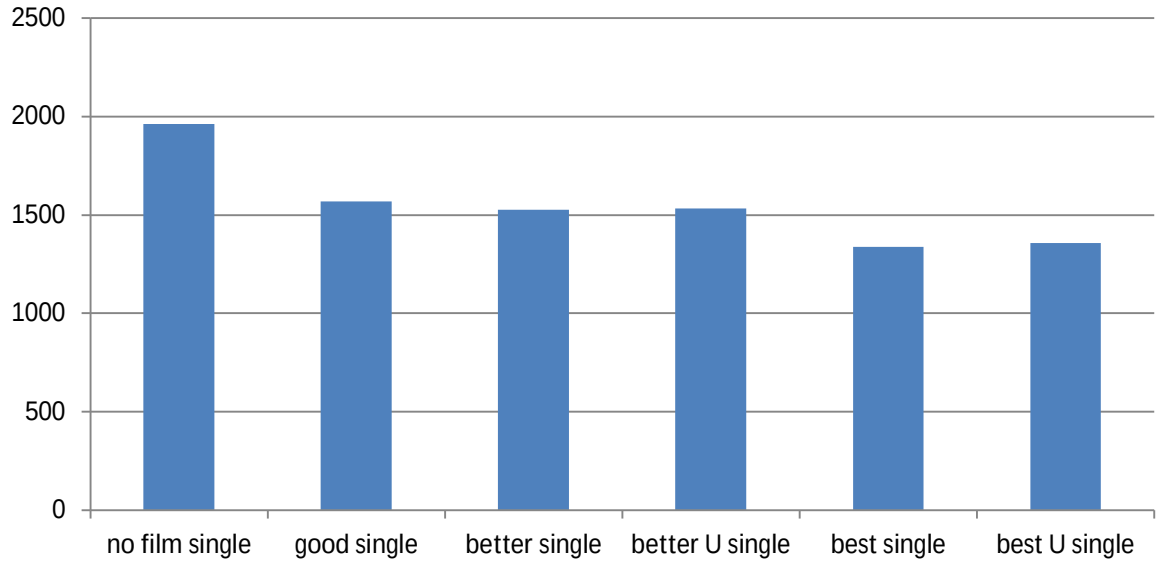


In the warmer climate zones of Riverside and the Central Valley, installing window films can save between 1 and 2 TDV per $100 spent when applied to double pane glass, and over 2 TDV per $100 spent when applied to single pane glass. In fact, in homes with single pane glass, there is little that one could do to improve energy performance more cost effectively.

Results in New Offices:





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Existing Offices in Fresno

SINGLE PANE	good	better	better U	best	best U
Total Electricity	5558	5513	5517	5215	5229
Total Gas	1376	1319	1288	1254	1189
Energy Cost	$ 835,111	$ 828,243	$ 828,874	$ 783,502	$ 785,547
Annual Savings	$ 88,055	$ 94,923	$ 94,292	$ 139,664	$ 137,619
Cost of Film	$ 199,614	$ 199,614	$ 274,469	$ 199,614	$ 349,325
	44%	48%	34%	70%	39%
Simple Payback	2.3	2.1	2.9	1.4	2.5

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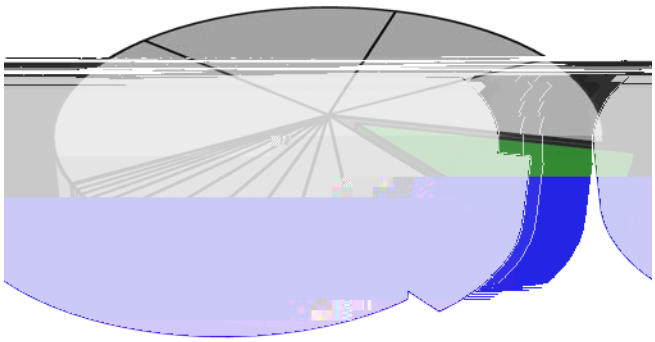

This is equivalent to the emissions from 3.5 million cars or from 1.8 million homes. It is also equivalent to a 14% reduction in energy use in every building in the state. ARB recommendations outline that part of that savings come from more stringent new buildings standards, but that 75% come from retrofits to existing buildings. The Scoping Plan suggests that there will be substantial pressure on voluntary (utility) programs as well as legislative requirements to improve the energy efficiency of existing buildings.

New construction has minimal impact on the GHG reduction goal. There are approximately 13,460,000 residential dwelling units in California. In 2011, 46,000 new residential units were constructed. If all residential units emitted the same amount of GHG, new construction would amount to only 0.34% (approximately one third of one percent) of annual GHG emissions in 2011 for California homes. In fact, new homes emit far less GHG than existing homes, meaning that new homes are an even smaller part of the equation. 2011, like the preceding few years, has been abnormally slow for the home building sector; yet, this trend is not expected to change for at least the next five years. The California Legislative Analyst Office predicts residential new construction will not recover until after 2017[1]. To effectively reduce residential sector GHG emissions, existing homes must be made more energy efficient.

[1] http://www.lao.ca.gov/reports/2011/bud/fiscal_outlook/fiscal_outlook_2011.aspx

Over 70% of GHG related to single-