

# Docket # 15-BSTD-01

2016 Building Standards Update

## UPDATED DIMINISHING RETURNS

August 8, 2015

Greetings

Continued thanks to Gene Thomas and others to motivate the CEC to allow what is in the existing 15-day language.

Since there is not very much low hanging fruit left, electric savings are significantly less and there is often the need to go with relatively expensive LED products. This is can be called diminishing returns.

**With diminishing returns any extra costs that make the financial returns any worse will often result in lighting retrofit projects not being done at all or shrunk, both of which will result in reduced energy savings.**

Diminishing returns can be critical with lighting projects, which currently have high performance fluorescent, high performance electronic ballasts and relatively short hours. There are millions and millions of square feet of this in California.

Here is one example of a good-sized project I retrofitted in 2007, and now they want to do a re-retrofit.

MOST COMMON FIXTURE TYPE FEASIBILITY STUDY																											
30-14		blended kWh rate		1.05		additional air conditioning savings (1.00 is none)										years of long term benefit											
existing						proposed																					
fixture type	watts	annual hours	annual electric cost	option	retrofit option description	rated lamp life hours @ 3 hour cycles	appr. watts	annual electric cost	watts per square foot (WSP) based on 1 troffer per 80 SF	watts reduction	% watts reduction	annual unit electric cost savings	appr. installed cost (excl. Title 24 costs)	appr. installed cost per SF (excl. Title 24 costs)	appr. kWh saved first year rebate multiplier	rebate	per year maintenance savings benefit for comprehensive long term benefit and payback	per year improved productivity benefit from improved lighting quality for comprehensive long term benefit and payback	per year combined maintenance savings and improved worker productivity benefit for long term benefit and payback	payback in years just electricity	payback in years electricity & maintenance	payback in years comprehensive	long term benefit just electricity	long term benefit electricity & maintenance	long term benefit comprehensive	GENERAL NOTES	CONTROL NOTES based on CEC DEER 16% savings with occupancy sensors, following are additional savings from each troffer retrofit
2x4 troffer with ALP upscale kit, 2 30,000 - 36,000 hour rated 3100 lumen F32T8 850 lamps & high performance 77 BF instant start ballast	48	3000	\$20.16	AT	Retrofit with 2 25W F32T8 850 extra long life fluorescent lamps, keeping existing ballasting (this may require 1 additional tunable LED task light per workstation at additional cost, which could replace existing task lighting)	50,000-60,000	38	\$15.96	0.48	10	21%	\$4	\$12	\$0.15	\$0.03	\$0.90	\$2	\$0	\$2	2.5	1.7	1.7	\$33	\$52	\$52	Ballast life is usually 15 years.	\$2.55
				BT	Retrofit with 1 32W highest lumen F32T8 850 fluorescent lamp & centering kit, keeping existing ballasting (this would probably require 1 additional tunable LED task light per workstation at additional cost, which could replace existing task lighting)	30,000-36,000	25	\$10.50	0.31	23	48%	\$10	\$20	\$0.25	\$0.03	\$2.07	\$2	\$250	\$252	1.8	1.5	0.1	\$84	\$101	\$2,601	Ballast life is usually 15 years. Dimming and Kelvin changing LED task light costs about \$100. Cord and plug task lights are not included in Title 24 calculations.	\$1.68
				C	Retrofit with 2 approximate 25W TLEDs, keeping existing ballasting	50,000	35	\$14.70	0.44	13	27%	\$6	\$30	\$0.38	\$0.08	\$3.12	\$2	\$0	\$2	4.7	3.5	3.5	\$30	\$47	\$47	Ballast life is usually 15 years, but life may be increased with TLEDs.	\$2.35
				CT	Retrofit with 2 16 - 20W TLEDs, keeping existing ballasting (this would probably require 1 additional tunable LED task light per workstation at additional cost, which could replace existing task lighting)	50,000	24	\$10.08	0.30	24	50%	\$11	\$30	\$0.38	\$0.08	\$5.76	\$2	\$250	\$252	2.3	1.9	0.1	\$82	\$96	\$2,596	Ballast life is usually 15 years, but may be increased with TLEDs. Dimming and Kelvin changing LED task light costs about \$100. Cord and plug task lights are not included in Title 24 calculations.	\$1.61
				DT	Retrofit with 1 high lumen 32W F32T8 850 fluorescent lamp, centering kit & 1.15 BF extra efficient instant start ballast (this may require 1 additional tunable LED task light per workstation at additional cost, which could replace existing task lighting)	30,000-36,000	38	\$15.96	0.48	10	21%	\$4	\$55	\$0.69	\$0.03	\$0.90	\$2	\$250	\$252	12.3	8.4	0.2	\$-10	\$9	\$2,509	Dimming and Kelvin changing LED task light costs about \$100. Cord and plug task lights are not included in Title 24 calculations.	\$2.55
				E	Retrofit with 34W 5000K LED lightbar system	50,000-100,000	34	\$14.28	0.43	14	29%	\$6	\$100	\$1.25	\$0.08	\$3.36	\$4	\$0	\$4	15.7	9.5	9.5	\$-35	\$2	\$2		\$2.28
				ET	Retrofit with 24W 5000K LED lightbar system (this would probably require 1 additional tunable LED task light per workstation at additional cost, which could replace existing task lighting)	50,000-100,000	24	\$10.08	0.30	24	50%	\$11	\$100	\$1.25	\$0.08	\$5.76	\$4	\$250	\$254	8.9	6.5	0.4	\$12	\$46	\$2,546	Dimming and Kelvin changing LED task light costs about \$100. Cord and plug task lights are not included in Title 24 calculations.	\$1.61
				F	Retrofit with approximate 32W 3000 lumen 5000K LED troffer kit	50,000-100,000	32	\$13.44	0.40	16	33%	\$7	\$160	\$2.00	\$0.08	\$3.84	\$4	\$0	\$4	22.1	14.1	14.1	\$-88	\$-49	\$-49		\$2.15
				FT	Retrofit with approximate 24W 3000 lumen 5000K LED troffer kit (this would probably require 1 additional tunable LED task light per workstation at additional cost, which could replace existing task lighting)	50,000-100,000	24	\$10.08	0.30	24	50%	\$11	\$160	\$2.00	\$0.00	\$0.00	\$4	\$250	\$254	15.1	11.0	0.6	\$-54	\$-14	\$2,486	Unless utility allows an exemption, there is no rebate on 2x4 LED troffer kits, which provide less than 3000 out of fixture lumens. But that may change this summer or fall.	\$1.61
				G	Retrofit with maximum 32W dimming and 2700 - 6500K changing LED troffer kit and shared smart wall controller	50,000-100,000	32	\$13.44	0.40	16	33%	\$7	\$250	\$3.13	\$0.00	\$0.00	\$4	\$750	\$754	35.4	22.6	0.3	\$-179	\$-139	\$7,361	Unless utility allows an exemption, there is no rebate on 2x4 LED troffer kits, which can go over 5000K.	\$2.15
GT	Retrofit with maximum 32W - set at 24W, dimming and 2700 - 6500K changing LED troffer kit and shared smart wall controller (this would probably require 1 additional tunable LED task light per workstation at additional cost, which could replace existing task lighting)	50,000-100,000	24	\$10.08	0.30	24	50%	\$11	\$250	\$3.13	\$0.00	\$0.00	\$4	\$750	\$754	23.6	17.1	0.3	\$-144	\$-104	\$7,396	Unless utility allows an exemption, there is no rebate on 2x4 LED troffer kits, which can go over 5000K.	\$1.61				

copyright © Stan Welschky, of Lighting Wizards, www.lightingwizards.com

You can see that most of the options and all of the really good options do not have very good financials based on hard savings, even without any Title 24 costs. Adding any Title 24 costs will make them even worse, which may kill the project.

You can also see how little occupancy sensors would annually save in rooms with three or four fixtures.

With four fixtures, annual energy savings would range from \$6.44 - \$10.20. Based on public sector or union facility, parts and labor for an occupancy sensor may be \$80. With controls certification costs and no rebate, straight payback should be about 8 to 13 years, which could kill the project.

With three fixtures, annual energy savings range from \$4.83 - \$7.65. Based on public sector or union facility, parts and labor for an occupancy sensor may be \$80. With controls certification costs and no rebate, straight payback should be about 11 to 18 years, which could kill the project.

For both options, although the shorter paybacks for controls look better, but that is not really the case, because with them are the highest wattage lighting options.

**If the CEC really wanted to maximize energy savings from lighting retrofits it should at least make the existing 15-day language better. Scrapping Title 24 or going back to 2010 version would be best.**

I do not understand certain entities wanting to keep controls mandates, because their projects could be killed too.

You can email or call at 10 AM or later Pacific Time during daylight savings time, which is 7 AM or later here in Hawaii. Thanks for your consideration.

Stan Walerczyk

Stan Walerczyk, HCLP, CLEP  
Principal of Lighting Wizards  
<http://lightingwizards.com/>  
[stan@lightingwizards.com](mailto:stan@lightingwizards.com)  
808-344-9685