Ecology Action Comments on Proposed Title 24 2016 Code Language

Background

Ecology Action is a 44 year old California-based nonprofit that specializes in designing and delivering energy efficiency and market transformation programs across the state. In the past decade, Ecology Action has implemented $84.3 million in energy efficiency contracts, specifically targeting Small and Medium Business (SMB) commercial customers and is widely recognized as the preeminent SMB retrofit leader in California. Commercial lighting retrofits represent a significant portion of our achieved savings: since 2010 alone, lighting upgrades performed under Ecology Action's programs have delivered more than 166 GWh of verified energy savings.

Ecology Action appreciates the work that the CASE team and others have done thus far on the Title 24 2016 update, and for the opportunity to provide feedback and comment. With respect to commercial lighting, we fully agree that the code overall should incorporate more aggressive strategies whenever practical. While we support many of the proposed Title 24 2016 changes, Ecology Action believes that elements of the existing and proposed code addressing commercial lighting retrofits puts at significant risk the energy savings that this key market segment has always delivered.

The 2013 code that came into effect on July 1, 2014 brought the most stringent and far-reaching changes in the history of California's energy code, and the impacts of these changes are only just now beginning to be felt. For program implementers, customers and stakeholders in the SMB market especially, some of these changes are proving to be very troublesome and put at risk the savings assumptions that the current code expects to deliver. In addition, aspects of the proposed 2016 code create further barriers to accomplishing commercial lighting upgrades in existing buildings.

Under the current code, many new construction requirements are being applied to the retrofit market and this is proving problematic in a number of situations. Certain 2013 code requirements are creating situations that drive inappropriate equipment specification and are increasing customer retrofit costs by 200-500% or more compared to the previous code cycle. We are finding that these situations are preventing many customers from participating in retrofit projects, resulting in lost savings opportunities because customers are instead opting to maintain old inefficient equipment.

On April 19, 2011, Ecology Action's made the following comments to CEC regarding the then-proposed 2013 code's probable impact on the SMB market:

"It's important to remember that the large majority of potential retrofit customers have to be convinced in order to get them to agree to upgrade their fully functional but outdated lighting systems, and they require significant incentives and hand-holding to be persuaded. These proposed code changes will result in a huge increase in out-of-pocket customer costs and paybacks well beyond the acceptable adoption threshold in this market. Faced with the much less compelling retrofit proposals that would result from the proposed code changes outlined herein, we believe that a very high percentage of business owners – on the order of 50% or more – will opt out of a retrofit entirely."

Unfortunately, much of what we predicted is now taking place. Provisions in the 2013 code that were put into place to help protect the SMB retrofit market (e.g., Modifications-In-Place), while beneficial, are proving insufficient to avoid the unintended negative consequences for a large percentage of potential customers. We believe that if a limited number of changes are made to the existing 2013 and proposed 2016 code language, most of these negative outcomes can be avoided and a healthy retrofit market can be continued while maintaining a continuously progressive code framework.

Ecology Action largely agrees with Title 24's treatment of new construction, additions and gut rehab projects. The following points apply ONLY to interior Lighting System Alterations (LSAs) and Modifications-In-Place (MIPs) which are NOT categorized as new construction, additions or gut rehab jobs. For additional related information and supporting data, see the Details section.

Summary of Key Points (Interior)

I. Multilevel Lighting is proving to be a prohibitively expensive and often unnecessary retrofit requirement for many customer types, and should be scaled back to some degree. Even though only two levels of lighting are required for LSAs and MIPs that come in at or below 85% of allowed LPD, the associated costs for establishing multilevel lighting are resulting in projects that are more than double their previous cost – with out-of-pocket increases (net after utility incentives) up as much as sevenfold. This is killing potential projects and causing a resurgence of "cream-skimming" (see Interior Details).

II. Actual replacement wattages for screw-in and track fixtures should count toward the retrofit's LPD. The code's treatment of screw-in and track fixture wattages is meant to discourage "snap back", i.e., the possible regression of these fixtures back to incandescent. This is driving illogical and sub-par retrofits and is at odds with long-standing CPUC and CEC policy which allows savings for screw-in CFLs and LEDs. These consequences can be easily avoided by adding a simple, single-sentence Exception to the Code. (see Interior Details).

III. High performance screw-in LEDs should count as their actual wattage in Commercial as well as Residential applications. Thus far, only the latter is being proposed by the CASE team for 2016; it needs to apply to Commercial jobs as well (see Interior Details).

IV. Until such time that GU-24 LED products achieve market parity with screw-in LEDs, screw-in sockets should be continue to be allowed in Commercial retrofits as well as Residential applications. GU-24 LEDs are not panning out in the California market (only 0.017% of approved LED products in the Energy Star database are GU-24), and so they do not offer the expected alternative to screw-in LEDs. At the same time, screw-in LED quality has markedly improved and are they are widely preferred by customers (see Interior Details).

V. The proposed LPA reduction to 0.50 W/sf for the "All Other" space type is excessively low, and should remain at the current 0.60 W/sf (see Interior Details).

VI. We believe the current JA8 indoor LED Kelvin requirements of 2700-4000K should remain in place. JA8 currently allows 2700-4000K for indoor LEDs. This is being proposed to lower to 3000K in 2016. Ecology Action supports the other JA8 LED provisions, but we strongly oppose this proposed restriction as arbitrary and unfounded. While many customers prefer warmer LED colors, this is by no means a given. We have found that many of our customers prefer the more neutral white color of 4000-4500K. Restricting customer choice in this manner will not gain any incremental savings and is not supported by research or scientific fact.

Summary of Key Points (Exterior)

I. The Code needs to include numeric thresholds in addition to the existing percentage thresholds for small exterior lighting jobs so that controls requirements do not penalize small customers and strand potential savings. Currently, controls requirements for exterior fixture replacements have three thresholds: <10% replaced, 10-50% replaced and > 50% replaced. These thresholds impose an undue burden on jobs for small customers where there are only a few existing fixtures. For example, for a site with ten existing fixtures, merely replacing one fixture (10%) triggers a time clock requirement that adds $1,000 or more to the job cost, leading to rejected proposals and zero achieved energy savings.

In these cases we need the option to do occupancy-based controls with photocells but no time clock. In the table below, black text is per 2013 Code and our proposed text is in blue (see Exterior Details).

Exterior Fixture Replacements	Controls Requirements
Lesser of ≤ 5 or < 10% of total	Existing controls permitted
Lesser of 6-20 or 10%-50% of total	Photocell plus either Occ-On or Partial-On
Lesser of > 20 or > 50% of total	Photocell plus either Occ-On or Partial-On plus Time Clock; Exception: Time Clock not required if existing circuiting negates probable Time Clock savings

II. LED should not become the de facto code baseline for exterior lighting in the 2016 Code. IES (Illuminating Engineering Society) is currently changing their design guidelines on parking lot lighting and is expected to significantly increase foot candle requirements. This is at odds with the CASE team's proposal to cut exterior LPDs by ~40%, which virtually mandates LED. Most importantly, moving the exterior baseline to LED in 2016 will effectively kill most exterior lighting retrofit projects in the Small and Medium Business (SMB) market. This is because most utilities will not offer incentives for code-minimum lighting upgrades. If the Title 24 exterior minimum becomes LED, most utilities will simply "sunset" exterior LED measures and stop offering rebates for them (they are already discussing this). This means that many SMB customers will simply not be able to afford these projects, especially given the added and expensive 2013 controls requirements which are also not rebated by utilities.

For these reasons, we believe proposed reductions to exterior LPAs should be limited to ~20% below their current levels. This will allow enough headroom to continue provide incentives that drive exterior LED retrofits in the SMB sector (albeit at reduced levels), and make it more likely that a compromise can be achieved to accommodate IES' exterior foot candle adjustments.

Details (Interior)

I. Multilevel requirements – right now – are killing potential projects due to excessive costs. Even though only two levels of lighting are required for LSAs and MIPs that come in at or below 85% of allowed LPD, the associated costs for dimming are resulting in projects that are more than double their previous cost – with out-of-pocket increases (net after utility incentives) up as much as sevenfold. This is killing potential projects and causing a resurgence of "cream-skimming".

In our first three potential fully compliant jobs, the Multilevel controls requirements have added major costs to our specification. The Table below reviews three actual MIPs jobs (the names have been changed). Two are Retail and one is Light Manufacturing. These are step dimming jobs that come in below 85% of allowed LPA and have no screw-ins or track fixtures. For illustration, each has been specified according to:

- Previous Title 24 Compliant Spec
- New Title 24 Compliant on Area Controls but does not include Multilevel Controls (Sensible Non-Compliant)
- New Title 24 Fully Compliant (as proposed to the customer)

Title 24 2013 Examples (all at or below 85% of allowed LPD)

		Previous Code Spec		2014 Sensible (Non-Compliant)		2014 Fully Compliant		Increase Over Previous Code	
Job Name	Primary Function	Total Job Cost	Co-Pay	Total Job Cost	Co-Pay	Total Job Cost	Co-Pay	Total Job Cost	Co-Pay
Tool World	Retail	$ 6,125	$ 1,753	$ 7,133	$ 3,241	$ 11,625	$ 7,792	**190%**	**444%**
Bob's Hardware	Retail	$ 7,960	$ 1,751	$ 11,913	$ 5,705	$ 18,461	$ 12,328	**232%**	**704%**
Precision Products	General Commercial	$ 10,484	$ 3,610	$ 13,067	$ 4,904	$ 20,425	$ 12,372	**195%**	**343%**

The problem the above Table demonstrates is the requirement for Multilevel is cost prohibitive. To be clear, the code requirement for Multilevel is User-Controlled Dimming. There are cases where occupancy-based dimming make sense, but in all but a few cases this is not a code requirement. We also are fully supportive of occupancy-based or time clock-based shut-off controls and are not disputing those requirements in this context.

If we look at the Tool World job, we see that last year it would have cost $6,125. The "sensible" spec would use a time clock to sweep the lights off at the end of the day at an additional cost of roughly $1,000. This makes sense, and the customer expressed interested if that were allowed. The customer however has zero interest in manually dimming during the day and would never operate in the dimmed state. The cost to provide this manual dimming – which would never be used by the customer – roughly doubles the total job cost and increases the post-rebate customer cost by more than 4x ($7,792 vs. $1,753). For the Bob's Hardware job, Manual Dimming increases the customer's net cost 7x ($12,328 vs. $1,751). Again, the customer stated they would never use the dimming capability. The same applies to the third site.

In short, the customers are not interested in moving forward with the fully compliant spec. The result is not only are the incremental savings for dimming not being achieved, no savings whatsoever is being achieved. These customers are saying "Thanks but no thanks, I'll keep my functioning lighting system as is."

The root problem here is twofold:

- The incremental cost of providing Manual Dimming in the built environment is beyond the level of customer acceptability
- Requiring Manual Dimming (i.e., two levels minimum) for Modifications-In-Place and Lighting System Alterations where it will practically never be used

Our suggestion is an exclusion from the Multilevel requirements for MIP and LSA jobs that are 85% of LPA or less in the Primary Function Areas listed below:

- Auto Repair Area
- Beauty Salon Area
- Commercial & Industrial Storage Areas (conditioned, unconditioned & Refrigerated)
- Corridors, Restrooms, Stairs, and Support Areas
- Electrical, Mechanical, Telephone Rooms
- Exercise Center, Gymnasium Areas
- Financial Transactions Area
- General Commercial & Industrial Work Areas (Low bay, High bay & Precision)
- Grocery Sales Area
- Kitchen, Food Preparation Areas
- Laboratory, Scientific
- Laundry Area
- Locker/Dressing Room
- Malls & Atria
- Retail Merchandise Sales, Wholesale Showrooms Areas
- Transportation Function Area
- Videoconferencing Studio

II. Actual replacement wattages for screw-in and track fixtures should count toward the retrofit's LPD.
For linear fluorescents and HIDs, §130.0(c) wattages are virtually the same as what implementers are working with now, so implementers can continue to use the actual wattages for those fixture types. But for screw-in CFLs and LEDs and for track lighting, the "allowable" fixture wattages are much higher. For those fixture types the wattage of what we actually install is not recognized by Title 24 because the customer "could" install something else later. For the CEC, CPUC, Investor-Owned and Municipal utilities, implementers, contractors and customers, actual installed wattage is recognized (including screw-ins and tracks) for determining savings, rebate and program performance. Snap-back and claimed vs. verified discrepancies are handled by using realization rates in the EM&V process. Title 24's application of §130.0(c) wattages to LSA and MIP retrofits conflicts with long-established practice and jeopardizes legitimate real-world savings.

By forcing implementers to use §130.0(c) wattages for screw-in and track fixtures when calculating the retrofit LPDs rather than the wattages of what they really install, many areas will end up > 85% of allowed LPD and would have to meet most new construction requirements, thereby increasing customer

costs to unacceptable levels. **Here are some of the practical results that are <u>already happening</u> due to the current code's treatment of screw-ins and track fixtures:**

- In "mixed use" spaces that include screw-ins (non-code triggering) plus other potential code triggering retrofits like MIPs, implementers are skipping the code triggering work and doing lamp replacements only. This is a sub-optimal retrofit, but it's viewed as better than losing the whole job due to the unacceptable costs associated with a new construction spec. Alternatively, implementers will re-spec those jobs to entirely exclude the areas that exceed the 85% threshold, thereby stranding those fixtures.
- Track fixtures, rather than being retrofitted with new LED track heads and lamps, are being passed over altogether due to the code's §130.0(c) wattage treatment and its requirement for expensive current limiters.
- Many implementers are bypassing midsize customers altogether and are targeting only jobs with fewer than 40 MIPs and jobs with screw-in replacements only.

What Is Needed: To avoid most of the unintended consequences described above, we propose the following Exception (shown in blue) to the Nonresidential Lighting Alterations section of Title 24:

> ***Section 141.0(b)2Ii. Luminaire Classification and Power*** *shall be determined in accordance with Section 130.0(c).*
>
> **EXCEPTION to Section 141.0(b)2Ii:** For ONLY 1) Lighting System Alterations in accordance with Section 141.0(b)2Iii, and 2) Luminaire Modifications-in-Place in accordance with Section 141.0(b)2Iiii, Area Category Method lighting power densities used in Table 141.0-E and Table 141.0-F to establish the Resulting Lighting Power, Applicable Mandatory Control Provisions and Applicable Multi-Level Lighting Control Requirements may be determined using actual installed wattages of both the unaltered luminaires and actual installed wattages of luminaires that are altered, modified or replaced including screw based sockets and track lighting.

Corresponding small changes would need to be made in the Nonresidential Compliance Manual to explain the above Exception.

III. High performance (i.e., high quality, high efficacy) screw-in LEDs should count as their actual wattage in Commercial as well as Residential applications. The CASE team so far is proposing to allow this for Residential projects in 2016. For the same reasons, it needs to apply to Commercial jobs as well. For High Quality High Efficacy lamps (JA8), rated lamp wattage should count in any luminaire in any commercial or residential application. It should not be limited solely to residential installations.

IV. Until GU-24 achieves market parity with screw-in LEDs, screw-in sockets should be continue to be allowed in Commercial retrofits and Residential applications. Less than 2% of approved LED products in the Energy Star database are GU-24, and therefore they do not offer the expected alternative to screw-in LEDs. The LED industry has made it quite clear that they are willing to let the California GU-24 market go. The top tier (GE, Philips, Sylvania) are not embracing LED for GU-24. The companies that are

even minimally addressing this market subset could be considered Tier 2 lighting manufacturers. See the Table below:

Energy Star Listed LED Lamps as of 10/8/14	1885
Manufacturer	# of GU-24 LEDs
Bulbrite	2
Efficient Lighitng	1
EiKo Global, LLC	9
Hengdian Group Tospo. Ltd.	2
Homelite	2
HYD Lighting	2
Illumis Lights	2
Liteline	1
Maxlite	8
Satco	2
TW Lighting	2
Total Products	31 (.017%)

Of the 31 total energy Star approved GU-24 based LED products, 27 are A-lamps, 2 are BR Lamps, and 2 are PAR 20s. This is not a workable offering, and it is not expected to improve significantly in the next few years, if ever.

At the same time, screw-in LED quality has markedly improved and are they are widely preferred by customers. NRDC and many others fought against the ban of the medium base screw socket because they saw how quickly these screw-in LEDs are evolving and improving. Customer satisfaction with these lamps is high, and feedback is indicating that "once you go LED, you don't go back." Until GU-24 LEDs gain parity (~50% share) with their Edison based counterparts, screw-in sockets should be allowed in both Commercial retrofits and Residential applications.

V. The proposed 2016 LPA reduction to 0.50 W/sf for the "All Other" space type is excessively low, and should remain at the current 0.60 W/sf. Ecology Action does not disagree with the other proposed 2016 LPA reductions, but unless it gets an allowance of some kind we believe the proposed 0.50 W/sf is unrealistically low for most "All Other" space type customers. The current 2013 value of 0.60 W/sf is already pushing it for existing buildings. If it is reduced to 0.50 W/sf (a further 17% reduction), lighting retrofitters would need to get to 0.425 W/sf to hit the critically important 85% of allowed LPD threshold. It also conflicts with the 0.50 W/sf or less of general lighting exemption that gets spaces out of multilevel and daylighting requirements.

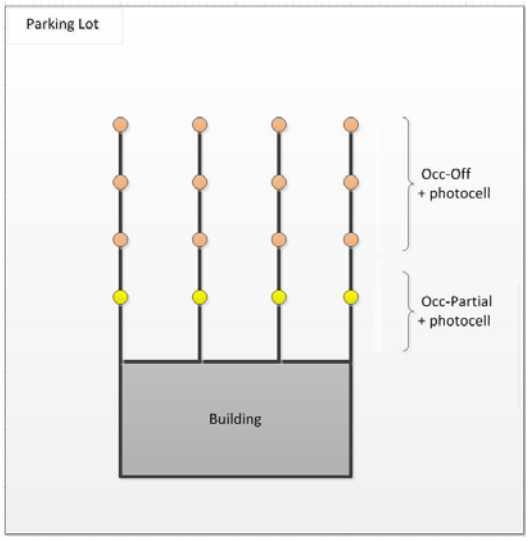
Details (Exterior)

I. The Code needs to include numeric thresholds in addition to the existing percentage thresholds for small exterior lighting jobs so that controls requirements do not penalize small customers and strand potential savings. Currently, controls requirements for exterior fixture replacements have three thresholds: <10% replaced, 10-50% replaced and > 50% replaced. These thresholds impose an undue burden on jobs for small customers where there are only a few existing fixtures. For example, for a site with ten existing fixtures, merely replacing one fixture (10%) triggers a time clock requirement that adds $1,000 or more to the job cost, leading to rejected proposals and zero achieved energy savings.

To remedy this, we believe the Code needs to include numeric thresholds in addition to the existing percentage thresholds for small exterior lighting jobs. These proposed provisions would apply to existing buildings with photocells only as shown in the Table below. For jobs with photocells and occupancy-off controls on ≤ 50% of fixtures the time the clock requirement would go away. In the table below, black text is per 2013 Code and our proposed text is in blue (see Exterior Details).

Exterior Fixture Replacements	Controls Requirements
Lesser of ≤ 5 or < 10% of total	Existing controls permitted
Lesser of 6-20 or 10%-50% of total	Photocell plus either Occ-On or Partial-On
Lesser of > 20 or > 50% of total	Photocell plus either Occ-On or Partial-On plus Time Clock; Exception: Time Clock not required if existing circuiting negates probable Time Clock savings

The two main problems with the current time clock requirements: 1) time clocks are cost-prohibitive on small jobs (minimum $1,000+), and 2) existing circuit layout will often result in a time clock never being used even if it were installed. Ecology Action brought up this problem in the May 15, 2014 exterior lighting stakeholder webinar, and it was suggested to "just change the circuiting". Unfortunately the problem can't typically be fixed with circuiting changes in most existing building exterior projects due to having to tear up pavement in a parking lot, etc. See the example below:



In the figure above, the parking lot has 16 existing fixtures on four circuits. The customer runs two shifts, and the parking lot lights are on all night but only the closest row of parking spots are typically used. The sensible retrofit would be to have only the four closest fixtures controlled by Partial-On Occupancy Sensors plus Photocells, and the remaining fixtures with Occupancy-Off Sensors plus Photocells. An added time clock control is cost-prohibitive in this scenario, and even if installed, would never be used. Attempting to achieve the sensible retrofit through circuiting changes is also not feasible due to the cost of tearing up the parking lot. We believe the addition of the numeric thresholds and related language we are proposing in blue above will alleviate this issue.

Ecology Action is grateful for the opportunity to provide feedback on these important issues, and will continue working with the Commission and key stakeholders to help achieve the California Energy Code's ambitious goals through 2016 and beyond.

Sincerely,

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