CE209-19

IECC: C405.4 (New), ASABE Chapter 6

Proponent: Eric Makela, New Buildings Institute, representing New Buildings Institute (ericM@newbuildings.org)

2018 International Energy Conservation Code

Add new text as follows:

C405.4 Lighting for plant growth and maintenance. Not less than 95 percent of the permanently installed luminaires used for plant growth and maintenance shall have a photon efficiency of not less than 1.6 µmol/J rated in accordance with ANSI/ASABE S640.

ASABE

ASABE
2950 Niles Road
St. Joseph MI 49085
US

Add new standard(s) as follows:

ASABE

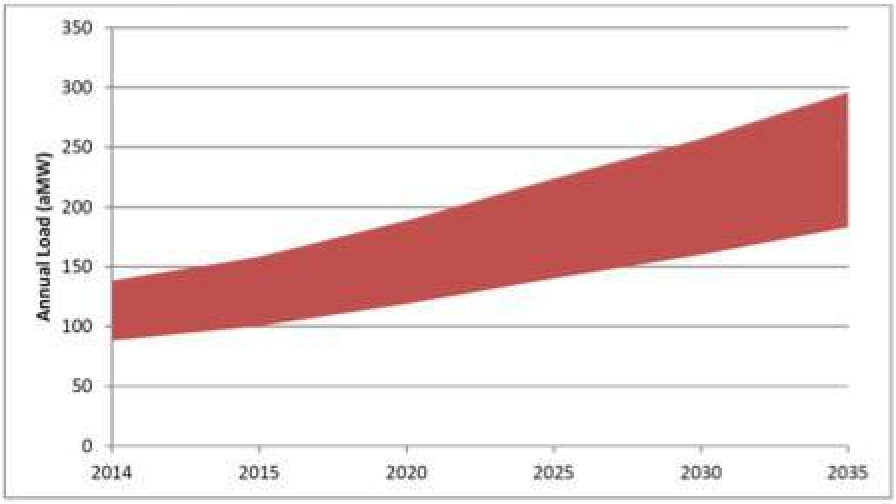
ASABE
2950 Niles Road
St. Joseph MI 49085
US

S640-2017: Quantities and Units of Electromagnetic Radiation for Plants (Photosynthetic Organisms)

Reason: Indoor agriculture energy usage is projected to grow substantially over the next several years, driven in large part (but not entirely) by the legalization of medical and recreational marijuana. As more and more states legalize medical and recreational marajuana, this will become an increasing national issue. If the ICC does not take action on this, industry is likely to see a patchwork of different and even conflicting local solutions.

The Northwest Power and Conservation Council projects that indoor marijuana growing operations alone will add as much as 300 average megawatts by 2030. That is equivalent to 1.5% of total regional electricity demand. Indoor agriculture operations not related to marijuana are expanding too. Indoor horticulture facilities can have EUIs that exceed even data centers.

PACIFIC NORTHWEST CANNABIS ENERGY LOAD FORECAST



Source: Northwest Power & Planning Council Seventh Power Plan, March 2016

ENERGY INTENSITY COMPARISONS

	Typical Site EUI* kBtu/sf	kWh/sf (of flowering canopy)	grams/kWh (of final product in flower form)
Outdoor (Sungrown)**	n/a	0	16
Greenhouse (Light Deprivation)**	84	33	8
Indoor (Efficient)**	~600	234	1+
Indoor (Inefficient)**	~1300	500+	1-
Office Building***	67	n/a	n/a
Hospital***	197	n/a	n/a
Data Center***	~600	n/a	n/a

*Assumes 75% of grow facility floor space is used for flowering canopy
**Data source: Self-Reported producer data from the Resource Innovation Institute Cannabis PowerScore
***Data source: US Energy Star Portfolio Manager

The price of LEDs has fallen dramatically in the past few years and local food movements in cities are driving increased demand for fresh high-quality produce that is grown close to the point of consumption. More restaurants are interested in sourcing ingredients directly from the producer, and in dense urban areas a growing number of new indoor agriculture operations have begun to meet this demand. This potent combination of policy, technology, and market factors is driving a dramatic expansion in indoor agriculture. As written, the 2018 IECC leaves lighting in this growing energy load completely exempt from efficiency requirements.

This proposal removes the loophole by requiring lighting used for plant growth or maintenance to either meet an efficiency metric . The efficiency metric of 1.6 µmol/J (micromoles per Joule) was developed in collaboration with the American Society of Agricultural and Biological Engineers and was developed specifically for lighting used for plant growth. It measures the number of photons emitted from the fixture per Joule of energy consumed. Lighting Power Density was developed as a metric to evaluate the light usable for visual tasks relative to the power consumed. Likewise, this metric was developed specifically to measure the light usable for plant growth relative to the power consumed. This metric is codified as an ANSI standard (ANSI/ASABE S640 – Quantities and Units of Electromagnetic Radiation for Plants (Photosynthetic Organisms))and is already seeing wide adoption in the industry with over 84 products available that meet this requirement when surveyed in 2016. More information on the metric can be found in the ANSI Standard: ANSI/ASABE S640.

Using a typical High Pressure Sodium lamps (a common growing light) as the baseline, this requirement will result in 78% savings. That is a substantially lower lighting load and a reduction in the cooling load.

Cost Impact: The code change proposal will increase the cost of construction
The proposal could marginally add to the cost of construction. The cost of horticultural lighting fixtures is actually driven to a large extent by reflectors and ventilation needs (horticultural lighting is positioned very close to the plants and venting the heat is essential) and not just lighting technology. Therefore, fixture cost can very dramatically, from $25/fixture to almost $1000/fixture for High Pressure Sodium fixtures and from $75/fixture to well over $1000/fixture for LED. And advancements and expanding market share of LED lighting has narrowed the impact of lighting technology. Therefore, lighting that meets this requirement can be obtained for less than lighting that does not. The only projects that will see an increase in cost are those using the absolute cheapest lighting that does not meet the requirement.

Proposal # 5155

CE209-19