ENERGY EFFICIENCY SAVINGS UP IN SMOKE

Snapshot: Definitions and Standards

Independent third-party guidelines and standards are emerging, enabling utility programs, building codes, and policymakers to adopt clear, consistent language and metrics around indoor horticulture energy use.

AVAILABLE NOW: ANSI/ASABE S640 – Quantities and Units of Electromagnetic Radiation for Plants (Photosynthetic Organisms)

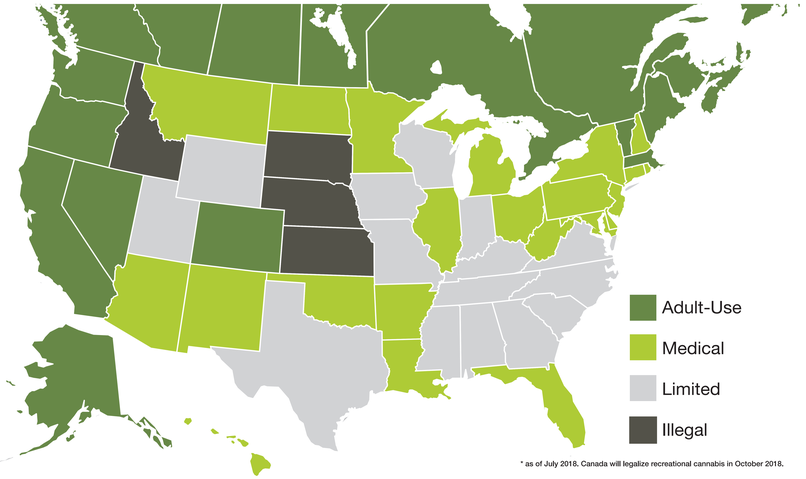
IN DEVELOPMENT: X642 -Recommended Methods For Measurements and Testing of LED Products for Plant Growth and Development
X644 –Performance Measures of Lighting Systems for Plants

The Budding Energy Impact of Indoor Horticulture

Indoor horticulture energy usage is projected to grow substantially over the next several years, driven in large part by the legalization of medical and recreational cannabis. As of July 2018, a total of 31 US States and the District of Columbia have legalized cannabis for medical use. Nine states have legalized both medical and recreational cannabis. In October 2018, Canada will legalize recreational cannabis use nationwide. This rapid shift in many parts of North America is driving much of the continent's energy load growth This rapid shift in many parts of the United States is driving much of the nation's energy load growth. The Northwest Power and Conservation Council projects that indoor cannabis growing operations alone will add as much as 300 average megawatts by 2030 in the Pacific Northwest: about 1.5% of total regional electricity demand. In Colorado, Xcel energy says 45% of its load growth is due to indoor cannabis cultivation operations. This is a brand-new industry, and right now, it's the Wild West out there. Energy performance metrics are not standardized. Grow lights are exempt from building codes and efficiency standards in most jurisdictions. Standard methods of test have not been published. How can we ensure that this fast-growing and energy-intensive industry adopts best practices in this environment?

Side-by-side comparisons of HPS (left) and LED (right) lighting (SMUD Indoor Horticulture Lighting Study, 2017)

CANNABIS LEGALITY ACROSS NORTH AMERICA*



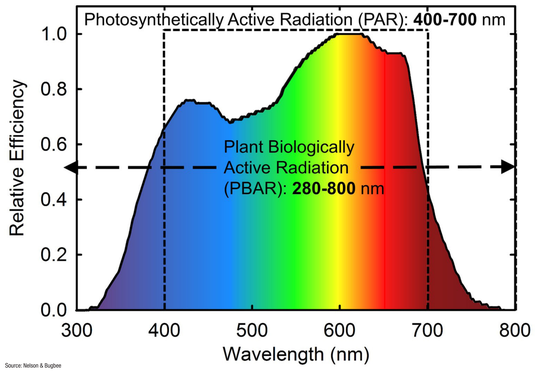
* as of July 2018. Canada will legalize recreational cannabis in October 2018.

Snapshot: Voluntary Programs

The rapid growth of a new industry, and the unique nature of the indoor horticulture industry in particular, means there are vast opportunities for energy efficiency in this space. Utility programs are a key way to encourage producers to use efficient equipment and practices. Certifications, recognition programs, and competitions represent another key track to improve efficiency.

- **UTILITY TECHNICAL ASSISTANCE:** Several utilities and energy efficiency organizations will pay for most or all of the cost to study energy-efficiency opportunities in new construction. Examples: Energy Trust of Oregon, National Grid, Xcel Energy, Tacoma Power.
- **UTILITY INCENTIVE PROGRAMS:** Some utilities provide programs specifically tailored to cannabis producers, while others include these projects in existing C&I programs. Incentives are limited to incremental equipment cost and are often in the $0.20-$0.25/kWh range.
- **VOLUNTARY RECOGNITION AND CERTIFICATION PROGRAMS:** Multiple organizations are working to create third-party labels, certifications, and to host competitions so that efficient producers can stand out in the market. For example, the nonprofit Resource Innovation Institute's free Cannabis Power Score energy benchmarking tool enables producers to confidentially compare themselves to their peers. This score has been used as a metric to score entries at the Cultivation Classic growers competition.

PLANT SENSITIVITY (MCCREE) CURVE, PAR, PBAR



Source: Nelson & Bugbee

Snapshot: Energy Codes

The building codes that indoor horticulture facilities must obey vary from city to city, and state to state. In most cases, these codes focus more on siting, security, hygiene (for processing) and nuisance (odor) mitigation than on energy. For their part, the energy regulations tend to focus on lighting. Jurisdictions are just beginning to consider indoor horticulture code requirements specifically for space conditioning and dehumidification.

CALIFORNIA: The California Department of Food and Agriculture requires cannabis production licensees to use renewable energy sources for at least 42% of power consumed at the site.

MASSACHUSETTS: The Massachusetts State Cannabis Control Commission has set a maximum lighting power density (LPD) of 36 W/ft^2 (or 50 W/ft^2 for operations for operations under 5,000 sf). Properly enforced, this nearly mandates the use of LEDs in indoor horticulture in the state.

OREGON: Oregon energy code measures are pending related to minimum photon efficiency and outside air ventilation in indoor horticulture operations.

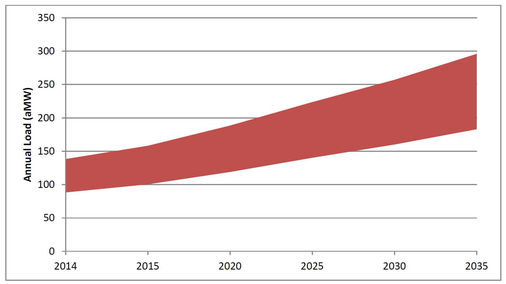
WASHINGTON STATE: The Washington State and Seattle energy codes require that lighting fixtures used for plant growth or maintenance have a tested photosynthetic photon flux (PPF) per watt of at least 1.20 µmol/J.

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

PACIFIC NORTHWEST CANNABIS ENERGY LOAD FORECAST



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

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