RESOURCE INNOVATION INSTITUTE

Lighting Key Terms

for Cannabis Cultivation and Controlled Environment Agriculture.

TERM	ABBREVIATION	DEFINITION	PREFERRED UNITS OF MEASUREMENT	WHY IT'S IMPORTANT ("THIS IS WHAT IT IS")	HOW IT'S OFTEN MISAPPLIED ("THIS IS WHAT IT'S NOT")
CULTIVATION					
Canopy area	n/a	Total rectangular area encompassing all square footage occupied by plants.	ft2 and m2	The total area under cultivation. In many jurisdictions this is the licensed sized of a grow facility.	It is not the same as total room size. In a vertical grow, for example, the canopy in a room will likely be larger than the room size.
Photoperiod	n/a	Number of hours per 24 hour day in which plants are exposed to light.	hours per day	Determines plant life stage in cannabis. Typical values are 18 hours of light for 'veg' and 12 hours for flower.	
ENERGY & POWER TERMS					
Watt	W	The amount of electrical power required to operate a device while it is on.	W	Primary unit listed on data sheets of electrical equipment for how much power the applicance will consume when powered on.	Safety labels near the power cord of products are required to list the Maximum Rated Power that the applicance can draw. The applicance in normal operation may consume less power than the label states. Be sure to consult the manufactuers data sheet before making power draw calculations.
Electrical Energy	kWh	The amount of electrical energy required to operate a device for one hour.	kWh	This is how the power company measures your facility's electrical consumption.	Electrical appliances and lighting fixtures are rated in Power (Watts) that they consume while on, not in Energy (Watts * Hours).
Joule	J	Scientific unit for energy. 3.6 million Joules = 1kWh	J	In lighting, this unit appears in the efficacy (or efficiency) rating of lighting fixtures in the form of umol/J.	
Mole	Mol	Expression for a quanitity of light energy.	Mol	A Mol is shorthand for a very large number (Avogadro's Number). It's a way to quanitify light as a finite quanitity of 'particles'. Mol is used in the units for DLI (daily light integral, see below).	
Micromole	µmol	Expression for a quanitity of light energy.	µmol	1 / 1000000th of a Mol, used in PPFD (see below), PPF, and PPE to make the numbers easier to read.	
CULTIVATION KPIs (key performance indicators or metrics)					
Facility Space Efficiency	g / sq ft.or g/ m2	Measures how much dried product is produced per square foot of canopy under cultivation.	g/sq ft. or g/m2	Since cultivators are limited by space by licensing, this metric determines the total output possible in a given square footage.	This metric makes no attempt to quanitify the amount of energy used. See 'Electrical Efficiency'.
Facility Electrical Efficiency	g / kWh	Measured how much dried product is produced per energy input.	g / kWh	This is the key peformance metric of energy efficiency for a grow. This represents the total electricity required to produce a gram, including lights, HVAC, pumps, fans etc.	This is not 'grams per watt' which is not an accurate measure for a modern facility.

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HORTICULTURAL LIGHTING					
Photosynthetic active radiation	PAR	Light energy from 400 to 700 nanometers (humans see this as violet to deep red) that plants use for photosynthesis.	n/a	Light in this range is the #1 nutrient needed for photosynthesis to grow plants.	PAR is a shorthand term for a range of light energy; it is not a unit. Oftentimes folks say 'PAR" when they mean to say PPFD (see below).
Photosynthetic photon flux	PPF	Total amount of light energy within the PAR range that a fixture produces every second.	µmol/s	Total amount of light a fixture produces within the Photosynthetically Active Radiation range of 400-700 nanometers.	PPF is not the amount of light your plants will get - it's the amount of light your fixtures produce. Fixture arrangement, fixture type, and distance from plants determine the light that gets to the plants (see PPFD).
Photosynthetic photon fluax density	PPFD	Amount of light energy within the PAR range that hits a given area of canopy every second.	µmol/m2·s	Quantity of light that reaches your plant canopy.	PPFD should be measured at several points and averaged in the area of the light fixture's area of coverage. Measuring at a single point (usually right under the fixture) is not a true representation and can be misleading.
Photosynthetic photon flux efficacy	PPE	Expression of efficiency of a lighting fixture. Total amount of light energy within the PAR range that a fixture emits divided by the amount of electrical power that it draws.	µmol/J	Represents the amount of light produced per electrical energy in.	This is measured by dividing PPF by the total power into the fixture. It does not take into account arrangement, fixture type, and distance from plants etc. It can also be measured in unrealistic conditions in a lab that can make the number look much better than it is in practice.
Daily light integral	DLI	Total PPFD received by plants in a day.	mol/m2·d	Traditional measurement of avaiable sunlight in field agriculture. This number is often given as a historical average. The long term nature of this measurement accounts for weather patterns, clouds, and day length at a particular location. Very important for supplemental lighting in greenhouses.	Outdoor growers and plant scientists will often say how much light a plant needs based on the DLI figure of a whole day due to variation in sun in clouds. Since indoor operations the light level is constant, indoor growers often say how much light a plant needs by PPFD level.
Spectral quantum distribution	SQD	Shows the distribution or composition of the light output in terms of spectrum wavelength (µmol/s/nm).	µmol/s·nm	Often shown as a graph.	Different manufactuers can format the data differently in spectrum plots - it can be hard to make very close comparisons between different lamps types and manufactuers.