



Lift and Grow presents

# Protecting Electrical ROI Through Precision Grow Light Spacing

A Return on Investment White Paper



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# Protecting Electrical ROI Through Precision Grow Light Spacing

The cannabis industry is growing increasingly competitive. For cannabis businesses, success in today's market requires a careful understanding of return on investment (ROI). For indoor cultivators, the use of precision controls over grow lights is a surefire way to ensure the efficient use of a major operational expenditure - electricity. To this end, Lift and Grow offers movable light systems that set careful controls on the space between grow lights and a garden canopy - ensuring that the maximum amount of light output is utilized in plant growth.

By focusing on indoor cultivation, this paper explains how precision spacing between lights and plants safeguards the efficient use of electricity in commercial production facilities. As such, Lift and Grow machines help ensure that cannabis plants maximize the **Photosynthetic Active Radiation (PAR)** light being emitted by horticultural lighting systems.

This document presents several key factors which illuminate the value of precision controls over grow light positioning as it relates to electrical ROI:

- A. Electrical Expenses with Indoor Growing
- B. The Inverse Square Law
- C. Cross Illumination
- D. Benefits of Precision Grow Light Spacing

This paper concludes with the fact that - if all other environmental and biological factors are accounted for in a garden operation - the efficient usage of PAR light by cannabis plants will lead to an increased ROI on electricity.



## A. Electrical Expenses with Indoor Growing

Electricity constitutes one of the primary operating expenses for indoor cultivation operations. To put this notion into perspective, the **National Conference of State Legislators website** explains that commercial cannabis growing is estimated to consume 1% of the electricity used in the entire United States, as well as 3% of the electricity used in California. These figures present more reason to work towards efficient lighting plans with indoor gardens.

According to a **market report published by the ArcView Group**, the value of indoor cannabis flowers has ranged anywhere from \$700 – \$1400 per pound in the years 2018 and 2019. Based on a usage cost of \$0.11 per kilowatt-hour, the report also states that the average cannabis company spends about \$150 on electricity per pound of flowers produced. In addition, looking to California, **Pacific Gas and Electric (PGE)** gives licensed cannabis businesses an **agricultural rate** of around \$0.15 per kilowatt-hour, costing growers around \$210 per pound.

### Electrical Cost Per Pound

<b>Average</b>	<b>\$150</b>	<b>22% of \$700 lb.</b>	<b>11% of \$1,400 lb.</b>
<b>California</b>	<b>\$210</b>	<b>30% of \$700 lb.</b>	<b>15% of \$1,400 lb.</b>

As can be seen with both national averages and California rates, electricity is a major expense for all indoor cultivation operations. Even more, the figures presented by the ArcView Group (baseline cost of 3.06 kilowatt-hours of electricity per gram of flowers) are based on experienced, professional garden operations.

In situations where novice cultivators fail to understand proper lighting schematics and plant spacing, **electrical costs** can easily spike to near or above 50% the value of a pound. These sorts of operational inefficiencies are enough to quickly put a cannabis company out of business.

As Jordan Miles, CEO of the lighting company **Agentix** tells us, “Efficiency is everything and only those with that front of mind at all times will survive the cannabis industry in the long run.”

While it is difficult to lessen the electrical overhead with indoor cannabis production, it’s possible to ensure that power is being used appropriately in these operations.







Cultivators that don't follow the inverse square law through precision spacing can greatly mismanage electricity usage. This notion is especially true in today's commercial cannabis operations, where work areas are often intermingled with a garden canopy. Because they are further from the light fixture, plants positioned at the edge of these work spaces receive less intense light than those directly beneath the source. Moreover, in these situations, cultivation teams struggle to keep usable PAR light from "spilling" into such work areas. Both of these challenges can only be addressed through precision light positioning.

Increased yields from efficient PAR light usage positively impact an indoor cultivation company's electrical ROI. This is because, Brendan Strath the Senior Solutions Director at **Spectrum King LED** tells us, "proper light spacing and canopy clearance is key to good plant health." For example, if you realize a consistent 5% increase in yield by taking measures to properly illuminate plants on the edge of a garden, the numbers are notable. For a modest-sized cannabis operation that harvests 1,000 lbs. per year, this small increase equals an extra 50 lbs. of flowers. In **today's market**, this uptick in production presents an additional revenue, on average, of \$52,500 in a single year. This additional income is wholly dependent upon precision spacing between light and canopy.

Moving forward, the inverse square law is most important to indoor growers because it helps us understand how different grow lights react with one another in a confined space. As commercial cannabis grows utilize large grids of lights to fuel their gardens, they must account for the intermingling of light from different sources. This notion is further complicated by the diminishing intensity of PAR light through the inverse square law. To this end, efficient horticultural lighting setups also need precision spacing to accurately control diminishing light as it is mixed from a number of sources in a grid pattern.





## C. Cross Illumination

Horticultural lighting engineers apply a practice known as “cross illumination” to achieve uniform lighting in a room. As mentioned previously, the practice of cross illumination is responsible for supplementing the light intensity lost due to the inverse square law. Because PAR light intensity is greatly diminished with the inverse square law, growers counterbalance this degradation by mixing PAR light from adjacent sources. While cross illumination presents unique challenges with different types of grow lights – such as DE HPS vs SE HPS – **its basic principles** are applied across the board.

Jordan Miles from Agentix tells us that correct perpendicular spacing between lights, combined with precise canopy spacing, creates “even-ness” of light on your garden. As seen with most facets of grow lighting, this practice is meant to mimic the even distribution of sunlight seen in the natural world. With cross illumination, Miles says, garden productivity is maximized by filling the canopy “with 100% of the light” needed by cannabis plants to grow.

When looking at grow light spacing in relation to cross illumination, it’s evident that the practice can be reduced to geometry. By applying proper perpendicular spacing between lights, as well as precise controls with vertical spacing above the canopy, PAR light rays from one fixture mix with PAR light rays from adjacent sources. In the end, these geometric light interplays mix to create uniform coverage for the whole garden canopy, as well as supplement the intensity lost with the inverse square law.





While the mathematical principles behind cross illumination are relatively simple, getting the practice right on a consistent basis can prove quite challenging. In the end, machine precision is one of the most effective ways to maximize uniform PAR lighting in a room through cross illumination. This notion is particularly noteworthy for many of the new LED lights on the market today, which are quickly becoming a favorite of cultivation teams worldwide.

Without precision controls over both light spacing and cross illumination, indoor cultivators run the risk of harming their plants. For example, accomplished Plant Scientist and Cannabis Consultant Brad Cohen tells us, “if high powered lights are placed too close to a plant, they can bleach the leaves and buds.” In a similar vein, Cohen also reports that “if certain grow lights are spaced too far from a cannabis garden, plants can stretch and form an uneven canopy. Even worse, buds become wispy and airy.” Unfortunately for cultivators who fall victim to improper light spacing, their electrical expenses remain constant, yet much of it is not used to stimulate plant growth.

As an illustration, let’s say a company is spending \$10,000 per month on electricity for grow lights, yet they have their lights positioned too high to give the plants 100% of the light they need. In fact, the diminished PAR light reaching the garden is only providing 80% of this need. The problem is, this company is paying for enough electricity to easily push the garden to its potential. However, 20% of this electrical expenditure is lost because 20% of usable PAR light is improperly angled and spread out beyond the canopy. The error costs this business \$24,000 per year in wasted electricity. The only way to ensure against these unnecessary expenditures is to apply precision spacing with cross illumination.





## D. Benefits of Precision Grow Light Spacing

In looking at such concepts as the inverse square law and cross illumination, we see that, over time, consistent errors in grow light positioning can have negative effects on a garden's performance. Therefore, conclusively, it's also evident that machine precision is the most surefire way to protect your cultivation business's investment in electricity. Because, if all other environmental and biological factors are accounted for in a garden operation, the efficient usage of PAR light by cannabis plants will lead to a better ROI on electricity.

Lift and Grow movable light systems give you the ability to control the position of your grow lights down to a millimeter. Due to our advanced understanding of industrial lift systems, our machines allow you to manipulate your grow lighting for consistent, maximized usage of PAR light output. As such, we let the machines do the "heavy lifting" with complex practices involving the inverse square law and cross illumination.

No matter how dependable an employee team at a cultivation facility, people still cannot match the efficiency of machine precision in protecting a business's ROI on electricity. Moreover, even the best grow room maintenance procedures and light monitoring exercises fall victim to human error. This is a simple fact.

Bottom line with indoor growing, more efficient usage of PAR light equals more efficient plant growth. In a similar vein, more efficiently used light equals less wasted money. Lift and Grow is here to protect cannabis cultivation companies by ensuring that a bountiful ROI on electricity is consistently realized.



## About Lift and Grow

By bringing decades of R&D work in commercial lift systems to the cannabis space, Lift and Grow is giving cultivators precision control over their grow light spacing. In the field, our movable light systems can be installed during an initial facility buildout or after an operation is up-and-running. Similarly, our platforms can be utilized in both indoor and greenhouse cultivation operations - with greenhouses presenting different logistical constraints.

For cannabis cultivators, the overhead cost of a Lift and Grow movable light system can be quickly compensated through the consistent harvests that our products promote. Moving forward, your cannabis company will help ensure a more sizable profit by maximizing the output of your electrical expenses.





## **Lift and Grow White Paper: Protecting Electrical ROI Through Precision Grow Light Spacing**

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