Advanced Energy

POWER FOR HORTICULTURAL LIGHTING

PREMIER TECHNOLOGIES | PROVEN CAPABILITIES

PRECISION | POWER | PERFORMANCE | TRUST

Your Global Partner for Horticulture Lighting Power Supplies

Advanced Energy's mission is to minimize your power consumption, installation expense and the cost of cooling facilities, while simplifying control and monitoring for any LED fixtures.

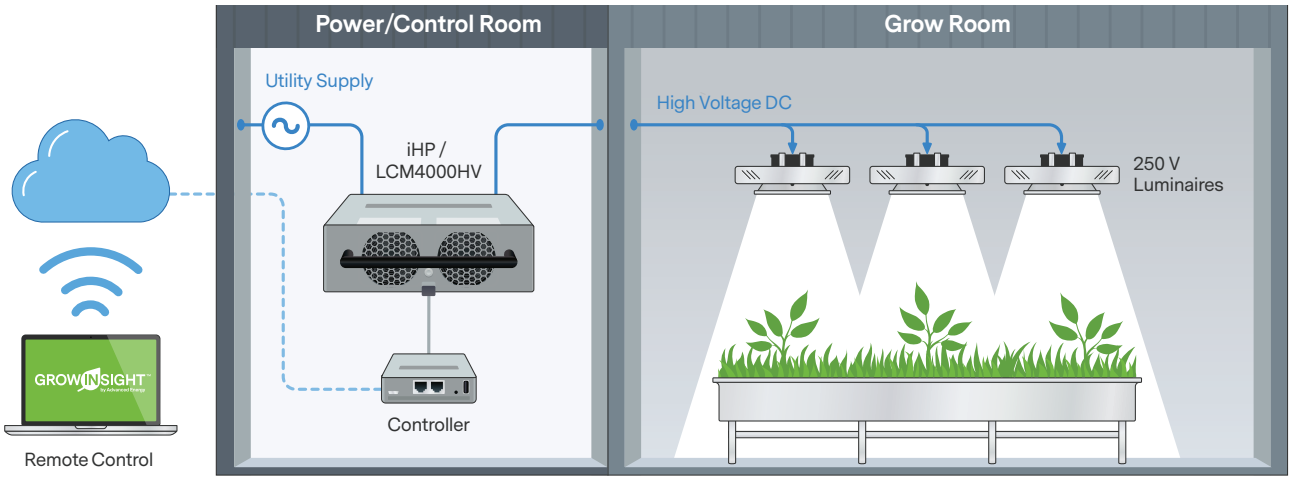
With Controlled Environment Agriculture, the use of individual drivers on each light fixture is not efficient.

The added complexity of individual control systems for each luminaire and the additional cabling required adds to your installation costs.

The additional air conditioning needed as a result of the collective conversion/heat losses from the drivers adds to your energy costs.

Using a large centralized power supply outside the environmentally controlled growth areas and distributing power directly to all the luminaires can help eliminate the need for individual drivers and the associated costs and complexity.

Advanced Energy's portfolio of horticultural lighting solutions puts world-class power, control and monitoring for indoor farming at your fingertips.



- Lower cost
- Simpler control and monitoring
- Trusted solution

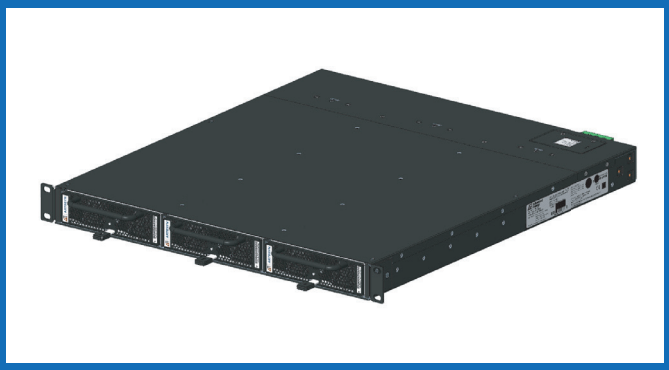
Our centralized, remote driver approach can reduce your capital investment by between 24% and 38% and help you save between 9% and 12% in annual running costs.

We have real customer case studies and installations that demonstrate these savings and the simplicity of control and monitoring that growers have achieved.

INNOVATIVE MODULAR AND SCALABLE POWER SOLUTIONS

LCM4000HV Series

Optimized for horticultural LED lighting



- High voltage power modules (100 – 300 VDC) combine with 19” 1U rack mount shelf (LCM12K) to create a centralized current source for medium- to large-scale LED lighting installations
- Each hot-swappable module rated for up to 4000 W, 12 KW per 1U shelf
- Cost and functionality optimized for horticultural LED lighting
- Compliant with DesignLights Consortium (DLC) technical requirements (v2.1)
- Up to 95% efficient
- Traditional 0-10V (0-24V) analog dimming – compatible with any PLC controllers and dimmers
- Digital control via Modbus RTU interface
- Drive any LED luminaire
- Digitally controlled loop compensation eliminates flickering throughout the operating range
- Compatible with GrowInsight™ cloud control software

Intelligent Transfer Switch (ITS)

- Patented solution for switching or sharing a single power source between two different grow rooms
- Reduces installation costs by reducing the number of power supplies needed
- Substantially reduces ongoing utility costs
- Designed to operate with two phases of a three phase input mains up to 480VAC nominal, or standard phase and neutral of single-phase mains

GrowInsight™

GROWINSIGHT™
by Advanced Energy

Advanced Energy's GrowInsight™ is a flexible, controlled environment agriculture control and monitoring system:

- Fully integrated with Advanced Energy's remote driver distribution
- Digital dimming control
- Create lighting schedules for any type of LED lighting system
- Cloud control and monitoring, local controller manages schedule execution
- Access lighting schedule information from anywhere
- Set alerts using text messages or email
- Monitor grow room sensors – CO2, humidity, temperature, PAR
- Camera integration

CASE STUDY: ONE ACRE OF INDOOR GROW AREA

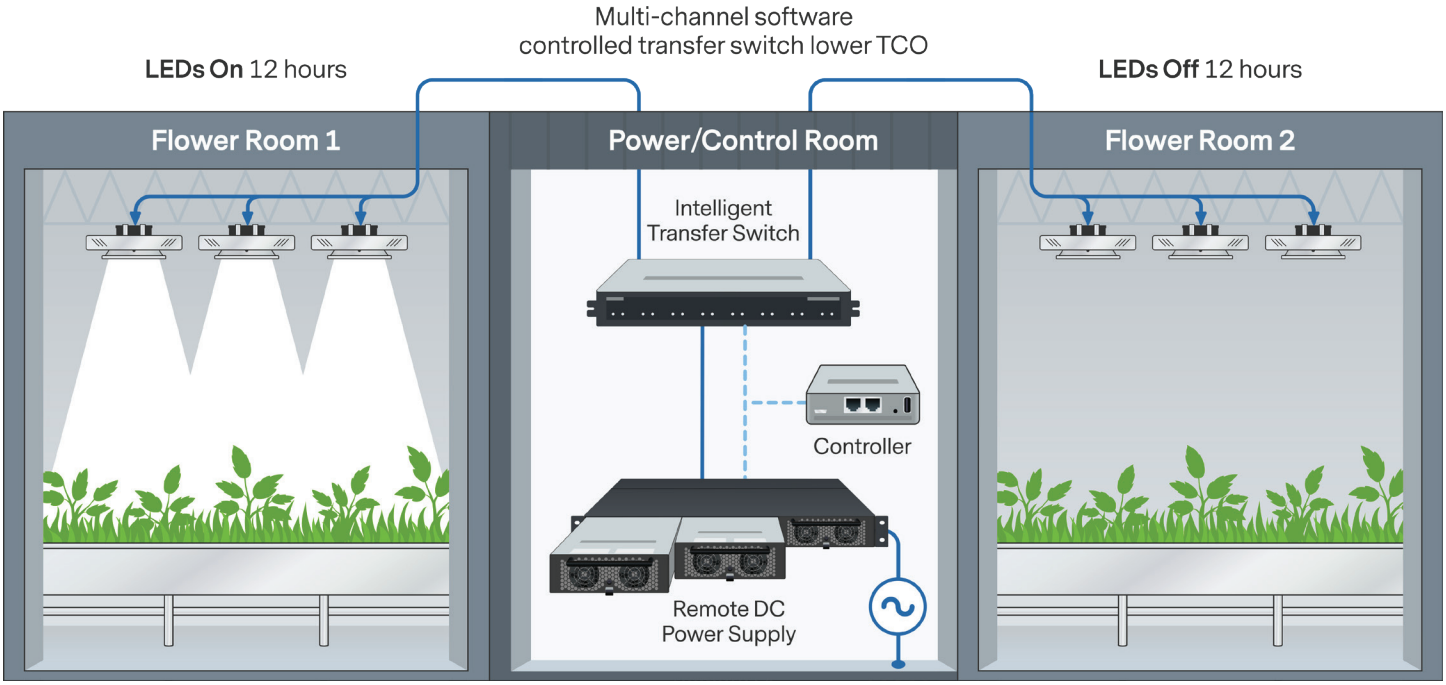
Based on over 44 customer engagements across the USA, we have prepared this case study to compare the traditional local LED driver approach with the centralized driver approach using a 208 feet by 208 feet (1 acre) grow area, illuminated by 1000w LED lights that each handle a 5 x5 ft area. These calculations compare the Advanced Energy Artesyn LCM4000 centralized driver with a typical local driver and reveals an ROI within approximately 2.6 years.

Traditional Local LED Driver	Centralized Driver
▪ 1 centralized driver can power many light fixtures, typically set up as a zone per driver ▪ Driver use 3 phase AC, higher PF, lower utility cost ▪ Uses DC voltage to connect lights ▪ No extra wiring for on/off & dimming control ▪ Can use digital control or analog, 0 to 10V, 0 to 5V, 0 to 24V ▪ Simplified installation lowers the labor cost ▪ Hot swappable drivers – easy to change	▪ 1 light fixture needs 1 driver ▪ Drivers use single phase AC, lower power factor, higher utility cost ▪ Need to run AC power to all the lights ▪ Need use many AC circuit breakers and panels ▪ Need extra wiring for on/off & dimming control ▪ Produces unwanted heat that will need a HVAC to control
CAPEX Summary: 24% Saving	
▪ Cost of 1743 LED Drivers (1000W) = $313,740 ▪ Cost of Lighting Control 1743 lights = $37,145 ▪ Cost of wiring, CB & CB Panels = $28,992 (872 CB, 21 Panels) ▪ Cost of HVAC & structure update = $21,500 ▪ **Total Capex = $ 401,377**	▪ Centralized Driver = $ 284,700 ▪ Cost of Lighting Control = $4160 ▪ Cost of wiring, CB & CB Panels = $15,250 (146 CB, 15 Panels) ▪ **Total Capex $ 304,110**
OPEX Summary: 9% Saving per Year	
▪ Energy Cost plus HVAC cost per year = $1,098,504	▪ Energy Cost per year = $982,872 ▪ GrowINsight yearly cost = $5,928 ▪ No additional HVAC needed in the grow area with the centralized driver ▪ **Total cost = $988,800**

Advanced Energy has detailed calculations to support these summaries as well as worksheets to help growers decide the best option based on their specific circumstances, please contact us for more information.

FLOWER ROOMS

The centralized driver approach enables you to use the same rack power source for two different grow rooms through the flowering stage of certain crops. With each room illuminated for 12 hours a day or less, the LCM4000 centralized driver rack would be 100% utilized.



With this approach, Advanced Energy has calculated even higher CAPEX and OPEX savings, with the capital expense saving being up to 38% and the operating expense saving at 12% per year. Detailed calculations are available from Advanced Energy on request.

CENTRALIZED DRIVER: LOWER TOTAL COST OF OWNERSHIP WITH ENHANCED CONTROL AND MONITORING

CAPEX Reduction between 24% and 38%		OPEX Reduction between 9% and 12%	
Lower cost of lighting control system	Eliminates expensive lighting PLC and IO controllers No extra dimming control wiring needed	**Reduced energy cost**	High power factor and low THD Lower HVAC energy cost
Smaller HVAC system and structure cost	No additional heat within the grow area Less weight per light reducing lighting structure	**Easily controlled**	Optimal setting for efficient light Web based controls and monitoring
Lower installation costs, simpler electrical connection	No special junction boxes Fewer circuit breakers Lower ship weight	**Lower maintenance cost**	Power all in one location vs. spread out Hot swappable power modules for quicker replacement of failures
Scalable	Grow as needed	**Very reliable, high MTBF**	Power not in the grow area environment Longer LED life due to no extra heat from the driver
		'Sea of Green'	More evenly distributed plant heights

ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than three decades to perfecting power for its global customers. We design and manufacture highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

Our products enable customer innovation in complex applications for a wide range of industries including semiconductor equipment, industrial, manufacturing, telecommunications, data center computing, and medical. With deep applications know-how and responsive service and support across the globe, we build collaborative partnerships to meet rapid technological developments, propel growth for our customers, and innovate the future of power.

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ENG-OT-Horticultural-Lighting-265-02 3.21