



GLASE  
GREENHOUSE LIGHTING  
& SYSTEMS ENGINEERING

---

# Industry Advisory Board

GLASE Summit November 2022

# WE'RE TRANSFORMING GREENHOUSE LIGHTING AND SYSTEMS MANAGEMENT

[About Us](#)



## NEXT GENERATION GREENHOUSE TECHNOLOGY

We work at the leading edge of LED systems engineering, plant photobiology, plant physiology, and greenhouse environmental controls.

[About Us](#)



# GLASE

GREENHOUSE LIGHTING  
& SYSTEMS ENGINEERING



Cornell University



RUTGERS



Rensselaer

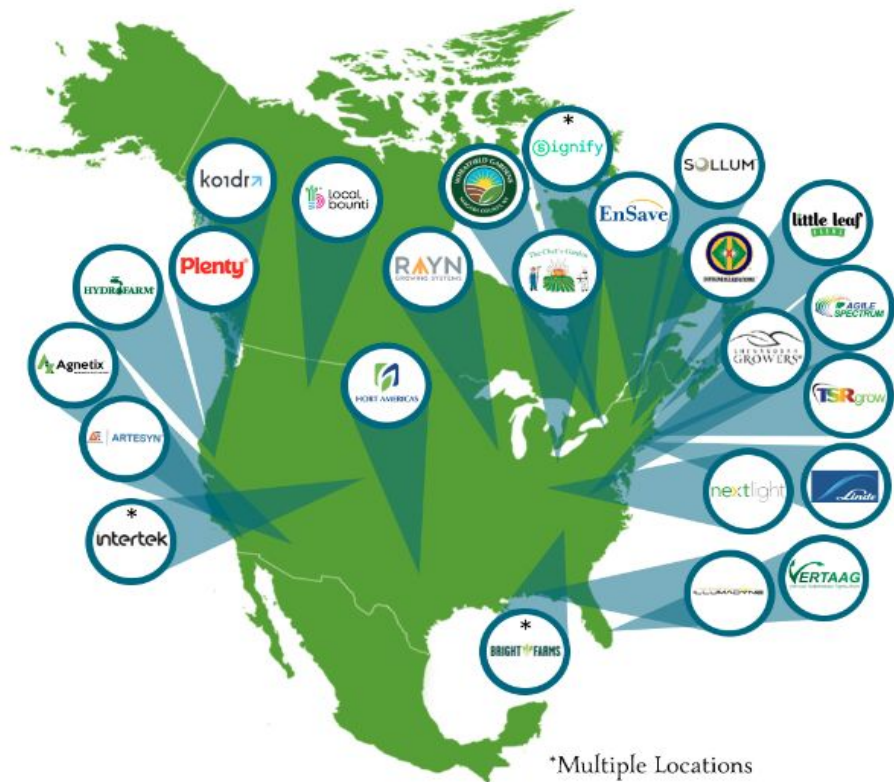


NYSERDA  
Supported





# GLASE Industry and CEA Members



\*Multiple Locations

## International Members:

Badia Farms (Dubai)

Nexsel (India)

Sherpa Space (South Korea)

### Dynamic LED systems



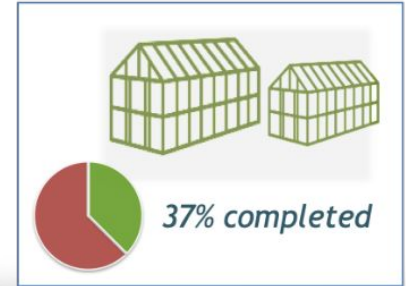
### Energy Efficacy



### Controls Integration



### Pilot Demonstrations



### Plant Sensing



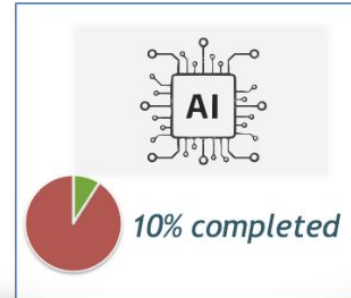
### CO<sub>2</sub> Enrichment



### Engineering and Modeling



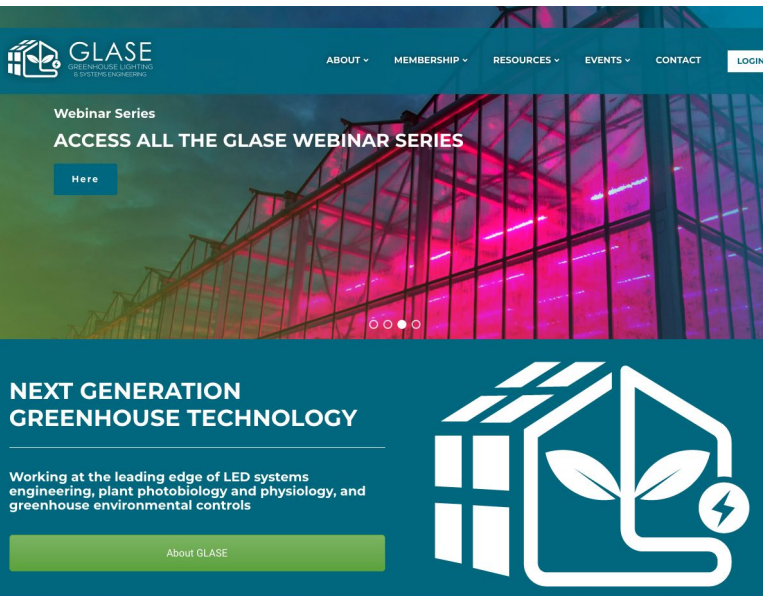
### Artificial Intelligence



### Hemp Research







**GLASE**  
GREENHOUSE LIGHTING  
& SYSTEMS ENGINEERING

ABOUT ▾ MEMBERSHIP ▾ RESOURCES ▾ EVENTS ▾ CONTACT LOGIN


Webinar Series  
**ACCESS ALL THE GLASE WEBINAR SERIES**

[Here](#)

**NEXT GENERATION GREENHOUSE TECHNOLOGY**

Working at the leading edge of LED systems engineering, plant photobiology and physiology, and greenhouse environmental controls

[About GLASE](#)




**GLASE**  
GREENHOUSE LIGHTING  
& SYSTEMS ENGINEERING

**Industry Advisory Board**

**Register Now for the February GLASE IAB Meeting**

Wednesday February 23  
3:00 - 4:30 pm EDT

Hello valued members of GLASE! Industry Advisory Board (IAB) meetings are one of the best perks to being a part of our consortium. We would love for all of our members to attend.

Register now to:

- Learn about GLASE research progress and business activities
- Network with other CEA growers and manufacturers
- Give your input on how GLASE can most benefit you in 2022

[Register Here](#)



**G** Summit

**L** 20

**A** 22

**S**

**E**



Category	2018 - 2021
Webinars	26
Technical Bulletins	10
Industry Talks	15
IAB meetings	10
Academic Meeting Presentations	14
Trade Publications	14
Peer review articles	2
GLASE tools	2
Filled IPs	5
Pilots Implementation	2

# Knowledge Transfer

---

## GLASE Tools and resources

- Thermal analyses protocol
- Lighting standards and regulations
- Available rebates and financial resources
- Lighting comparisons
- LASSI
- Energy modeling
- Data sharing
- Greenhouse Benchmark tool

# Tech Implementation

---

## 5 filled Intellectual Properties

- New LED modules for indoor cultivation
- Remote fluorescence detection system
- CO2 LASSI (2 applications)
- Real time LASSI

## Implementation

- GLASE: 2 commercial pilot facilities in NYS
- USDA SCBG: 8 commercial implementations in NYS





# Resources

## Online Tools: LASSI

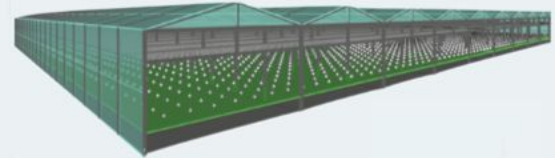
- Available to GLASE Members
- Assessment of current energy consumption
- Assessment of potential energy savings
- Supports decision making process



- ABOUT ▾
- MEMBERSHIP ▾
- SHORT COURSE
- RESOURCES ▾
- CALENDAR
- CONTACT
- MY ACCOUNT ▾

### Online LASSI

The Light and Shade System Implementation (LASSI) algorithm, is an advanced lighting control system designed to precisely control greenhouses supplemental lighting and retractable shade operation to provide growers a consistent daily light integral (DLI) year round.



### Simple to use

This simple to use tool will provide users the ability to run different scenarios and cost analyses by varying installed lighting capacity and crop lighting requirements.

- 1) Insert your specific information
- 2) Run the analyses
- 3) Compare annual and monthly analyses

#### Simulation input summary

Project Title	LASSI
Zip Code	14850
On Peak Rate:	0.12 (\$/Wh)
Off Peak Rate:	0.04 (\$/Wh)
Demand charge	4.5 (\$/kW)
On Peak Hour Start	7 (0-24)
On Peak Hour End	22 (0-24)
Width	10 (m)
Length	30 (m)
Growing Area Percentage	85 (%)
Transmittance	70 (%)
Wattage	200 (W)
Number of Lamps	30
PPF at Crop Level	175 (umol/s/m <sup>2</sup> )
Light Control	LASSI
Target DLI	20 (mol)
Shade Mode	LASSI
Shade Transmittance	50 (%)

#### Annual Summary

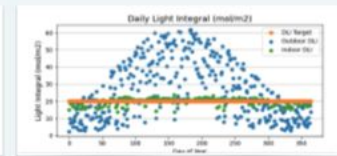
Annual Lighting Energy Consumption (kWh)	1925.0
Mean DLI (mol)	19.0
Annual Energy Costs (\$)	132.8

#### Monthly Report

Month	Energy Consumption (kWh)	Average DLI (mol)	Monthly Lighting Hours
January	3269	18	844
February	2988	19	444
March	1394	18	232
April	625	20	104
May	180	20	31
June	469	20	78
July	61	20	16
August	497	20	62
September	1515	20	252
October	2037	20	338
November	2845	18	473
December	3454	19	575

### Energy Savings

Compare different lighting control strategies and determine the potential energy savings provided by the use of advanced lighting controls.



Available at [glase.org](http://glase.org)



# Resources

## NYS GH Database & Benchmarking Tool

- Available to GLASE members
- Benchmark of CEA facilities
- Data mining benefits

Available at [glase.org](http://glase.org)

The screenshot shows the GLASE website's resources page. At the top is a dark teal navigation bar with the GLASE logo (Greenhouse Lighting & Systems Engineering) on the left and menu items: ABOUT, MEMBERSHIP, RESOURCES, CALENDAR, CONTACT. On the right of the navigation bar are two buttons: 'BECOME A MEMBER' (yellow) and 'LOGIN' (white). Below the navigation bar are three main resource sections, each with a green icon and a title:

- IMPROVE** (flower icon): Identify the main sources of energy use for your greenhouse. Compare your own data over seasons and years to determine areas of improvement and priorities.
- COMPARE** (document icon): Understand how your data compares to anonymous greenhouses of similar size and like technology. See where you fall on the spectrum of energy use.
- CONTRIBUTE** (plus sign icon): Help the greenhouse database grow in content and accuracy. Benefit from yearly State of Industry reports based upon nation-wide data.

Below these sections is a 'HOW IT WORKS' section with a vertical list of steps on the left and a description on the right:

Apply	Fill out an application for an Agriculture Energy Audit with NYSERDA and select the Greenhouse Benchmarking Report option as your area of interest.  Mail application to:  NYSERDA Attn: Agriculture Energy Audit Program Administrator 17 Columbia Circle Albany, NY 12202-6200
Consultation	
FlexTech Visit	
Results	

To the right of the 'HOW IT WORKS' section is a photograph of a large commercial greenhouse filled with various green plants.



# Partnerships

Leverage GLASE technologies to secure new projects and grants

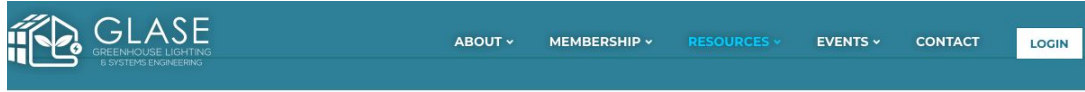
Title/Sponsor	Amount	Period	Outreach	Outcomes
Database & Benchmarking Tool <i>NYSERDA</i>	\$224,817	3 years	80 comercial GHs in NYS	Industry baseline Energy use efficiency improvements
Advanced lighting controls implementation <i>USDA SCBG</i>	\$99,868	1.5 years	8 comercial GHs in NYS	Technology Implementation Energy use efficiency improvements Improve operations profitability

# GLASE Outreach & Education

---



# 2022 GLASE Webinars



**GLASE Webinar Series**  
Plant Factory Innovations in Japan

**Dr. Eri Hayashi**  
Japanese Plant Factory

## Plant Factory Innovations in Japan

October 13, 2022

**GLASE Webinar Series**  
CEA Round Table:  
Lighting Manufacturers

**SOLLUM** Sponsored by:  
Sollum Technologies

## CEA Round Table: Lighting Manufacturers

August 25, 2022

**GLASE Webinar Series**  
Greenhouse Growers' Round Table:  
The Path to CEA Sustainability

**SOLLUM** Sponsored by:  
Sollum Technologies

## Greenhouse Growers' Round Table: The Path to CEA Sustainability

August 2, 2022

**GLASE Webinar Series**  
CEA Round Table: Indoor Growers

**RAYN** GROWING SYSTEMS  
Sponsored by:  
RAYN Grow Systems

## CEA Round Table: Indoor Growers

July 6, 2022

**GLASE Webinar Series**  
Collaboration with Academia and Industry:  
Case Study of the Dutch CEA Industry

**Dr. Leo Marceelis**  
Wageningen University

## Collaboration with Academia and Industry: Case Study of the Dutch CEA Industry

May 13, 2022

**GLASE WEBINAR SERIES**

**CEA Round Table:  
Utility Companies**

March 24, 2022  
2:00 - 3:00 pm EDT

**REGISTER NOW**

## CEA Round Table: Utility Companies

March 25, 2022

Date	Webinar	Live	Recording	Total
Feb 24	CEA Research and Extension at Texas A&M AgriLife at Dallas	65	93	158
March 24	CEA Round Table: Utility Companies	56	66	122
Apr 20	Lighting in Indoor Cannabis Cultivation	127	-	127
May 26	Collaboration with Academia and Private Growers	63	187	250
June 23	CEA Round Table: Indoor Growers	89	187	276
Jul 21	CEA Round Table: Greenhouse Growers	64	125	189
Aug 25	CEA Round Table: Lighting Manufacturers	85	175	260
Oct 27	Plant Factory Innovations in Japan	78	210	288





# 2023 VIRTUAL CLIMATE CONTROL SHORT COURSE



**GLASE**  
GREENHOUSE LIGHTING  
& SYSTEMS ENGINEERING

Jan. 19 - Feb. 23  
Thursdays 2 - 4 pm EST

6 Weeks  
6 Modules

- | Light
- | Temperature
- | CO<sub>2</sub>
- | Humidity
- | Irrigation
- | Autonomous

Register Now

Live and On-Demand





## The Event

- 6-week interactive virtual course via Zoom Events
- January 19 - February 23
- Live modules Thursdays 2:00 - 4:00 pm EDT
- Recordings available On-Demand

## Target Audience: 300-400 attendees

- Greenhouse growers and managers
- Indoor farm growers and managers
- Industry consultants
- Climate control manufacturers

## Confirmed Speakers

- Kale Harbick (USDA-ARS)
- Timothy Shelford (Cornell University)
- Kellie Walters (University of Tennessee)
- Representative (Plenty)
- Ying Zhang (University of Florida)
- A.J. Both (Rutgers University)
- Josh Craver (Colorado State University)
- Jennifer Boldt (USDA-ARS)
- Stephanie Burnett (University of Maine)
- John Lea-Cox (University of Maryland)
- Fengqi You (Cornell University)
- Fokke Kracht (Koidra)
- Md Shamim Ahamed (UC Davis)



## Module 1

Lighting Controls  
Jan 19 from 2-4 PM  
E.T.

**Outcome:** Understand how supplemental lighting systems enable consistent, quality crops year-round.

**Confirmed speakers:** Kale Harbick (USDA-ARS), Timothy Shelford (Cornell)



## Module 2

Temperature Controls  
Jan 26 from 2-4 PM E.T.

**Outcome:** Discover how efficient temperature sensors and controls can improve crop production and reduce operation costs.

**Confirmed speakers:** Kellie Walters (Tennessee)



## Module 3

Humidity Controls  
Feb 2 from 2-4 PM E.T.

**Outcome:** Learn the intricacies of measuring and controlling fluctuating humidity in your greenhouse to better control plant growth and health.

**Confirmed speakers:** Josh Craver (Colorado), Jennifer Boldt (USDA-ARS)



## Module 4

CO2 Controls  
Feb 9 from 2-4 PM E.T.

**Outcome:** Learn about available technology to measure and control CO2 concentrations in your greenhouse to improve fruit yield, flowering, and plant strength.

**Confirmed speakers:** Ying Zhang (Florida), A.J. Both (Rutgers)



## Module 5

Irrigation Controls  
Feb 16 from 2-4 PM E.T.

**Outcome:** Explore different systems of greenhouse irrigation and learn how to control exactly how much water plants receive.

**Confirmed speakers:** Stephanie Burdett (Maine), John Lea-Cox (Maryland)



## Module 6

Autonomous Controls  
Feb 23 from 2-4 PM E.T.

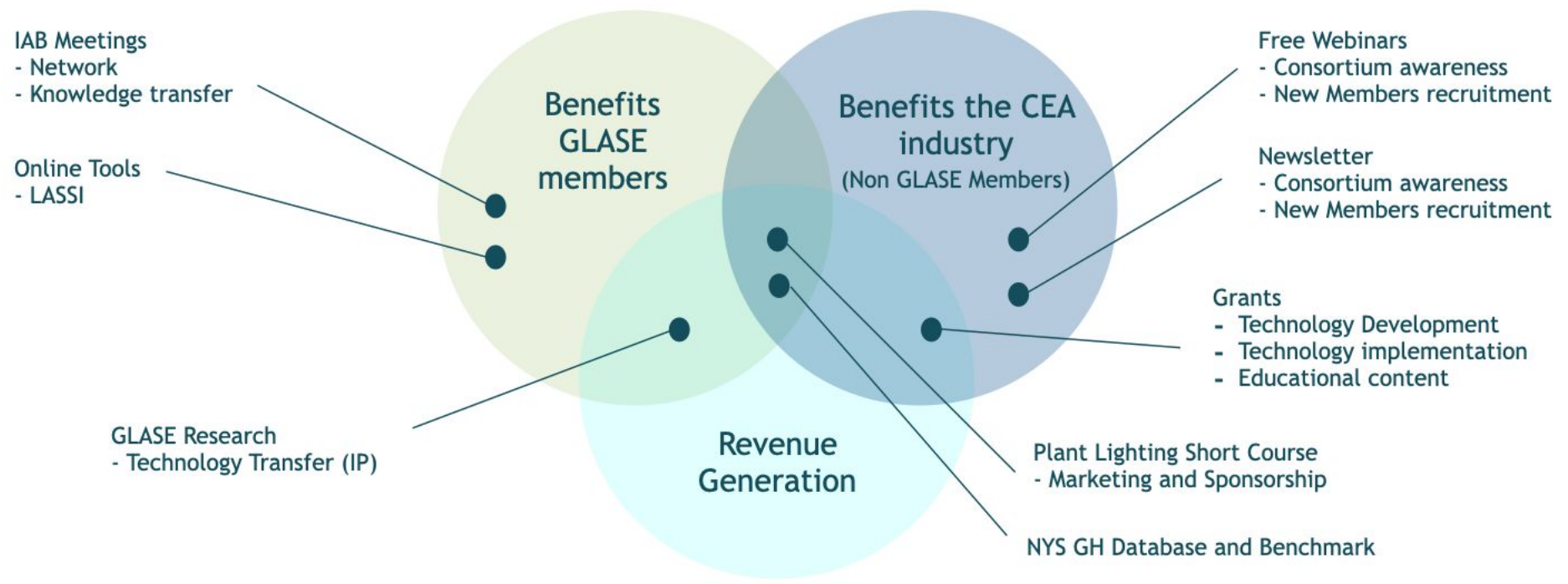
**Outcome:** Understand how autonomous technologies can control all aspects of a greenhouse's climate and how growers are using them in real operations.

**Confirmed speakers:** Fengqi You (Cornell), Shamim Ahamed (UC Davis), Fokke Kracht (Koidra)

# Path for Sustainability

---







## Core Activities

### Define areas of industry relevance

- Expand successful activities
- Increase members engagement
- Industry surveys
- GLASE members feedback
- Identify/expand academic partnerships
- Market Transformation
- Implementation



## Business Model

### Value Proposition and Sustainability

- Industry Membership
- Training workshops
- Fed/State grants
- Industry partnerships



## Marketing

### Awareness and Value

- Increase industry awareness
- Recruit new members
- Opportunity for GLASE Members





# Partnerships for Climate-Smart Commodities

[Equity](#)

## Climate Solutions

### Partnerships for Climate-Smart Commodities

[Partnerships for Climate-Smart Commodities Project Summaries](#)

[FAQs](#)

[Climate Change Adaptation and USDA](#)

USDA is committed to supporting a diverse range of farmers, ranchers, and private forest landowners through Partnerships for Climate-Smart Commodities. This effort will expand markets for America's climate-smart commodities, leverage the greenhouse gas benefits of climate-smart commodity production, and provide direct, meaningful benefits to production agriculture, including for small and underserved producers.

On September 14, 2022, Secretary Vilsack announced USDA is investing up to \$2.8 billion in 70 selected projects under the first pool of the Partnerships for Climate-Smart Commodities funding opportunity. Projects from the second funding pool will be announced later this year. Ultimately, USDA's anticipated investment will triple to more than \$3 billion in pilots that will create market opportunities for American commodities produced using climate-smart production practices.

# Climate-Smart Greenhouse Crops through Advanced Plant Lighting Controls

---

- Implement Advanced Plant Lighting Controls (APLCs) at **36 greenhouses**
- Anticipated coverage crop canopy area of **3 million square feet (69 acres)**.
- Anticipated GHG emission reduction of **9,038 to 27,116 MtCO<sub>2</sub>e** over the 4-year project.
- Anticipate energy savings of approx. **6 kWh/ft<sup>2</sup>/yr**.
- For a one-acre greenhouse, this equates to an average annual savings of:
  - a. 259,500 kWh
  - b. \$25,950 at \$0.10/kWh
- Applied across the U.S. CEA industry, a total potential savings of **\$340 million** and **1.45 million tons of CO<sub>2</sub>** can be achieved.

## New Executive Director

---

- Business expertise
  - Define the consortium path and long term goals
  - Lead to consortium to self-sustainability
- 
- Part Time or Full time - depending on Climate-Smart Commodity grant results