



USDA CEA MARKET TRANSFORMATION STRATEGY

*Data-Driven Market Transformation
for Efficient, Sustainable CEA*

January 25, 2022



United States Department of Agriculture

Natural Resources Conservation Service

CEA Market Transformation Strategy

Overview

About RII

USDA Funded Project: Data-Driven Efficient CEA

Market Characterization / Recommendations

Market Transformation

Market Intervention Strategies

Benchmarking

Promoting Efficiency

Coordinating Producer Support Systems

Targeting Producers for Intervention

Implementation Plan

11 am ET

11:15 am ET

11:35 am ET

11:50 am ET



Panelists



Derek Smith



Chris Callahan



Jen Amann



Gretchen Schimelpfenig



The background image shows a multi-story vertical farming facility. It features numerous horizontal racks stacked vertically, each filled with green leafy plants. The racks are supported by a complex metal framework. The lighting is bright, and the overall atmosphere is one of a high-tech agricultural environment.

SECTION 01

OVERVIEW

ABOUT US

About RII

Objective, data-driven non-profit addressing energy, water & emissions in CEA

Founded 2016 in Portland, Oregon, to study the resource impacts of cannabis cultivation

Expertise in climate policy, utility programs, green building certification, sustainable business, construction & indoor cultivation

In late 2020, awarded three-year USDA grant to develop KPIs, best practices, standards and a facility performance rating system for CEA



What We Do / Our Mission

We measure, verify & celebrate the world's most efficient agricultural ideas.



Measure

Efficiency & Productivity

- Key Performance Indicators
- Benchmarks
- Baselines



Verify

Best Practices & Standards

- Education & Training
- Policies
- Utility Programs



Celebrate

Leadership Recognition

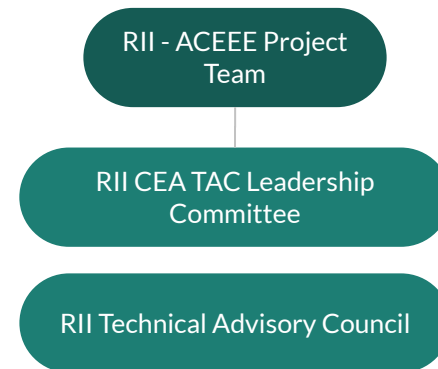
- Case Studies
- ESG Support
- Certification

ABOUT US

Technical Advisory Council

Multi-disciplinary Working Groups aggregate knowledge to support producers and other stakeholders with objective and peer-reviewed data and curriculum on benchmarking resource efficiency

- **Guide** development of standards
- **Shape** tools and resources to support best practices
- **Advocate** for informed policies, incentives and regulations



ABOUT US

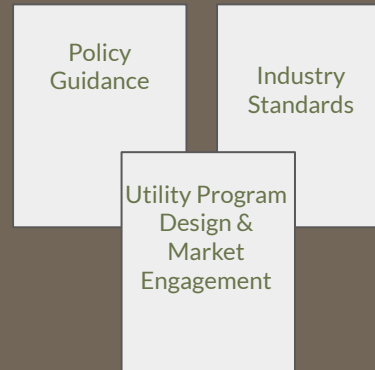
Peer-Reviewed Publications



Best Practices Guides *for Producers*



Best Practices Guides *for Governments and Utilities*



Industry Reports *on Resource Usage*



ABOUT US

Specialized Benchmarking Platform

- **Facility performance** benchmarks aligned with industry-standard KPIs on energy, water & emissions
- **Efficiency plans** to guide continuous improvement of KPIs
- **Guidance** on how to maximize incentives and support from utilities and governments
- **Portfolio** audits and reports to compare efficiency and productivity of cultivation assets for ESG reporting and investor stakeholders
- **Thought leadership** opportunities to be featured in case studies and conference presentations

Calculated PowerScore

#47974088-21, Indoor, Grantsville, MD, Climate Zone 5A, July 2020 - June 2021

Get Verified

Whole Facility

Energy

45th percentile

Non-Electric Efficiency 188 kBtu / sq ft 30% better 71st percentile

Emissions Efficiency 13.4 kg CO₂e / sq ft 31% better 100th percentile

Lighting Efficiency 2,820 kWh / day 87% better 81st percentile

HVAC Efficiency 392 kBtu / sq ft 0% change 3rd percentile

Water

94th percentile

Water Efficiency 0.523 gal / sq ft 8.2% worse 97th percentile

Waste

68th percentile

Waste Efficiency 0.24 lbs / sq ft 0% change 80th percentile

Year-Over-Year



24.4% better

Select a second PowerScore for comparison snapshot or add another:

#47974085-21, Motown Gro

Overall: Middle-of-the-Pack

Your operation's overall performance within the data set of indoor facilities in PowerScore's Ranked Data Set:



45th percentile

Come back to check your PowerScore regularly to see how your rank changes as more facilities benchmark their performance!

Oldies

Facility

Canopy Productivity 0.243 kg / sq ft 0% change

50th percentile



RESOURCE
INNOVATION
INSTITUTE



Data-Driven Market Transformation for Efficient, Sustainable CEA

Launched 2021

Funded through 2023 by:



United States Department of Agriculture





Natural Resources Conservation Service

USDA PROJECT

Grant Objectives & Timeline

 Deliverable

 Milestone

Scope	2021	2022				2023			
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Market Transformation Strategy									
PowerScore Benchmarking Reports on Energy and Water KPIs, Baselines, & High-Performance Strategies, Pre- and Post-Project Reports									
Best Practices Guides and Case Studies for CEA: Lighting, HVAC, Design & Construction, Controls, Irrigation & Water Reuse									
Best Practices Guidance for Local, State and Federal Policy, Energy Codes, and Industry Standards									
Best Practices Guidance for Utility Program Design & Market Engagement, CEA Excellence Network, CEA Professional Credentialing									
Voluntary Certification System and Key Performance Indicators for CEA									

USDA PROJECT

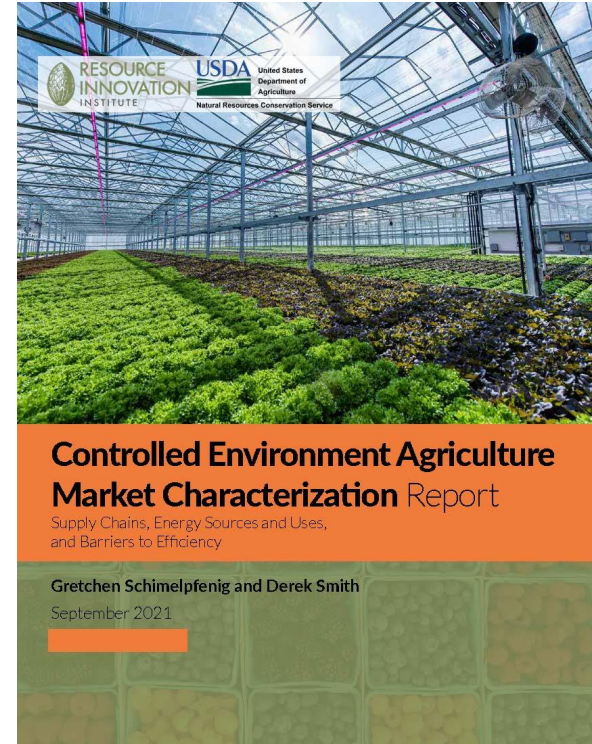
CEA Market Characterization Report

What it is:

- Based on primary and secondary research: lit review, surveys, interviews
- Precursor to Market Transformation Strategy

What it is not:

- Precise
- Exhaustive
- Technology baseline study



Research Objectives

1. **Describe the supply chain**, key market actors, barriers to energy efficiency, and the best leverage points for market interventions,
2. **Describe the energy sources** used by producers (including on-site renewable energy, microgrids, and back-up generation),
3. **Describe the energy and non-energy benefits** realized through implementation of efficiency projects,
4. **Identify key market baselines** to be used in evaluating the impact of the market transformation initiative over time.



Recommendations

1. Benchmark a range of production environments to enable development of energy use baselines.
2. Promote the benefits of energy efficiency in ways that are compelling to producers.
3. Leverage key market actors to develop coordinated producer support systems.

Target producers effectively based on cultivation approach, geography, power supply costs and size/scale of operation.



About Market Transformation

Market transformation is the **strategic process** of intervening in a market to create **lasting change** in market behavior by **removing identified barriers or exploiting opportunities** to accelerate the adoption of all cost-effective energy efficiency as a matter of standard practice.

Market Transformation Components

Three **must have** components of any MT initiative:

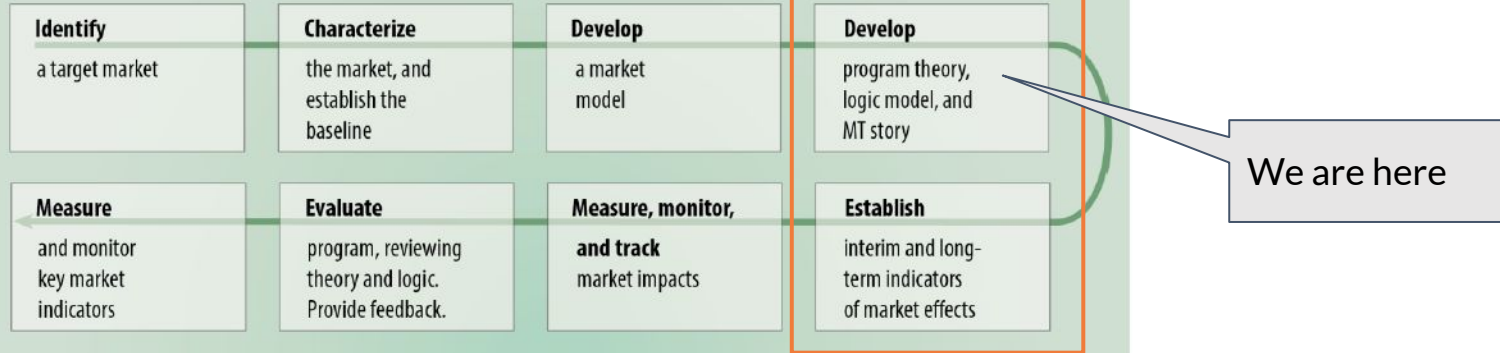
In-depth knowledge
of the targeted
energy efficiency
market

Clearly defined
intervention strategy
and key leverage points

Policy/regulatory
framework
supporting the
intervention strategy



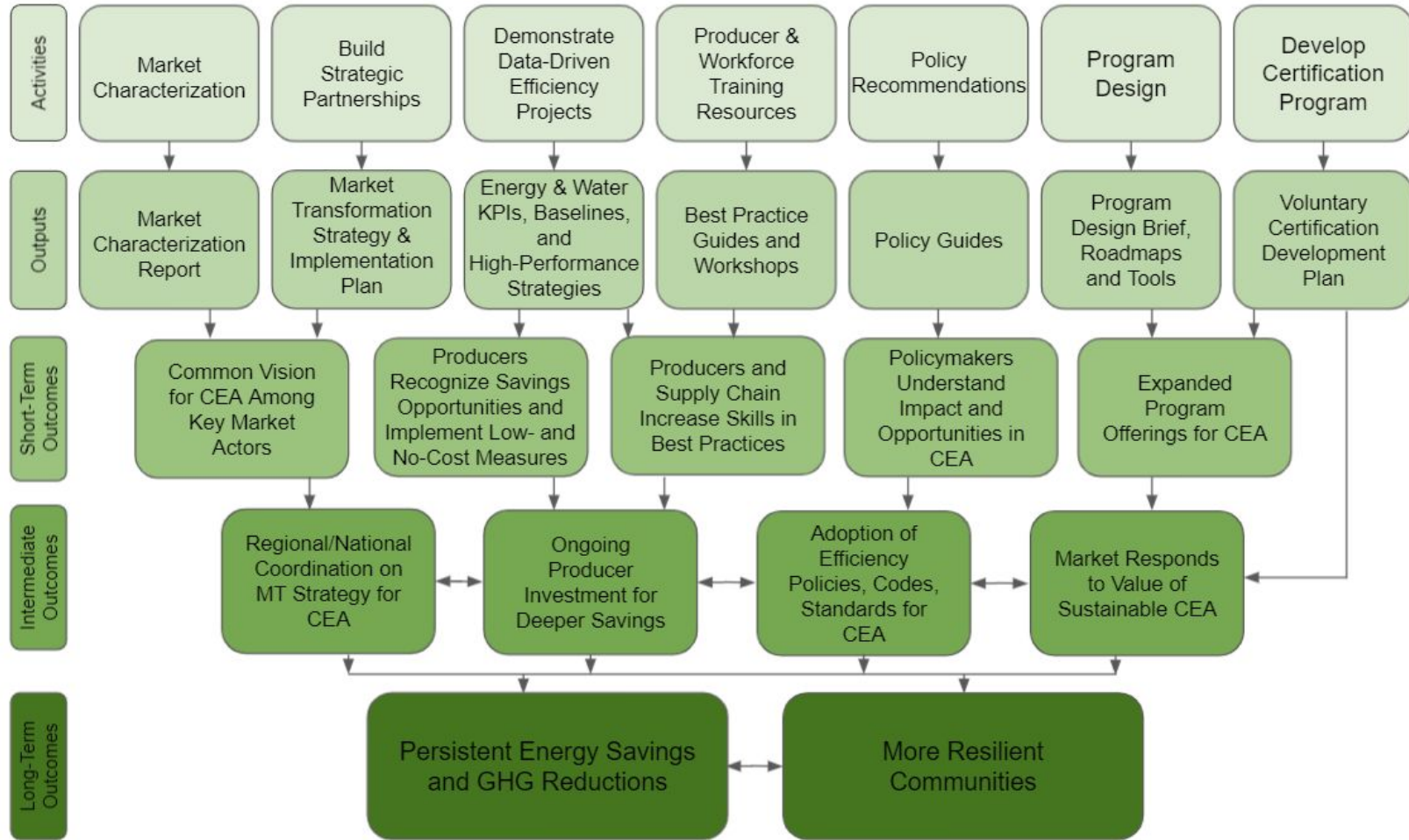
Analytical process



Implementation process

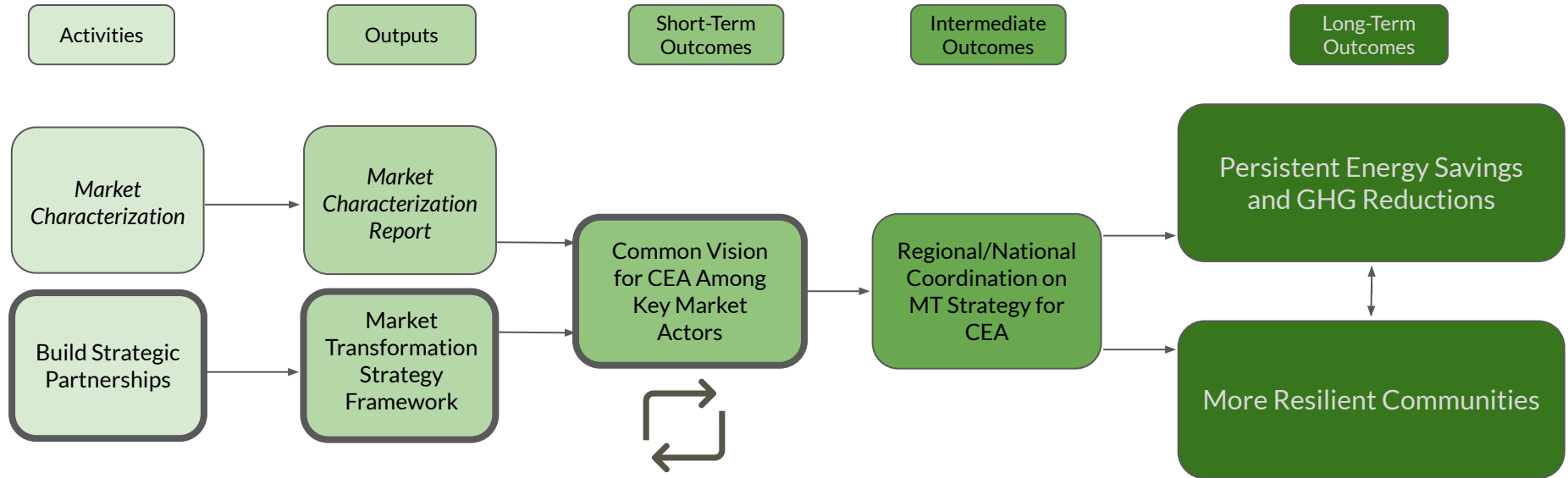


Logic Model for Data-Driven Market Transformation for CEA



USDA PROJECT

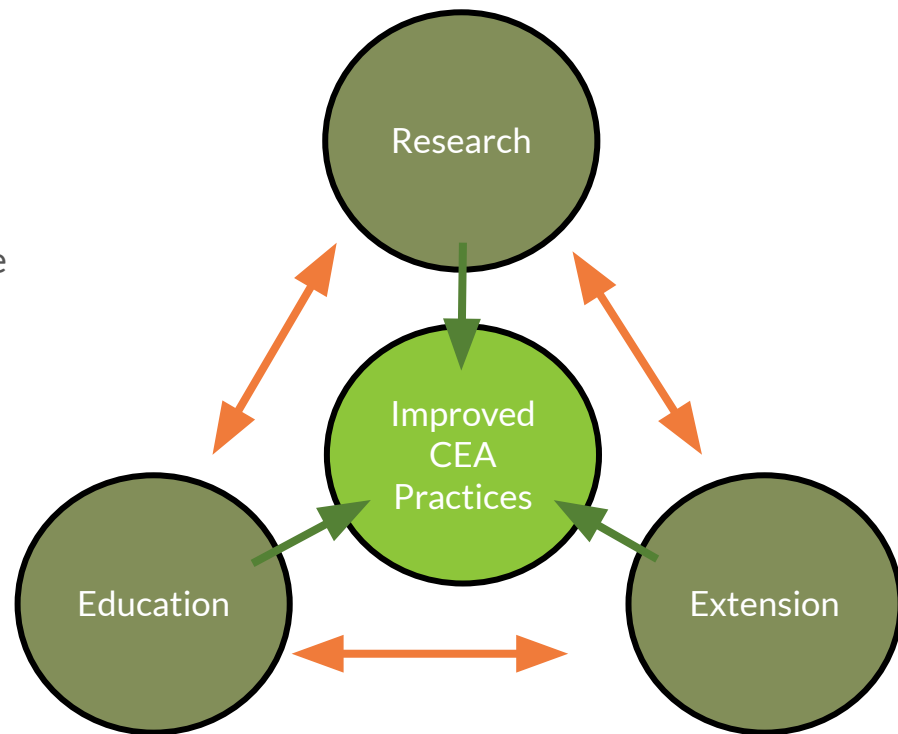
Market Transformation Strategy Framework



Outreach, Education, & Additional Research

Leveraging the Land Grant University System (LGUS) and Cooperative Extension to expand the project impact

- Best practices guidance, codes, and standards are communicated to producers via Extension network
- Awareness of benchmarking and standards.
- Technical assistance in support of adoption of practice
- Informing future research and educational needs





SECTION 02

MARKET INTERVENTION STRATEGIES

Market Transformation Pathway

VISION: Sustainable, resource-efficient CEA supported by rigorous data and shared best practices



BARRIERS

Lack of data, baselines, and success stories



Supply chain knowledge, skills, and support



Low grower awareness and demand

High first/capital cost and limited incentives



STRATEGIES

BENCHMARKING

Benchmark diverse set of producers and facilities to establish baselines and key performance indicators

PROMOTING EFFICIENCY

Engage and educate installers and builders to create experts along the supply chain and establish credentialing program

Demonstrate peer success through case studies, educate producers on energy and non-energy benefits

SUPPORTING PRODUCERS

Convene policymakers, utilities, and key market actors to develop coordinated producer support systems and industry standards



STRATEGY #1

BENCHMARKING

STRATEGY #1: BENCHMARKING

Create Facility Performance Snapshots

Confirm Key Performance Indicators for CEA

Quantify performance of CEA facilities using specialized key performance indicators for:

- Efficiency
- Productivity

Establish calculation methodology for KPIs

Understand how KPIs apply to various crops

Calculated PowerScore

#47974088-21, Indoor, Grantsville, MD, Climate Zone 5A, July 2020 - June 2021

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94th percentile

Water Efficiency 0.523 gal / sq ft ↓ 8.2% worse 97th percentile

Waste

68th percentile

Waste Efficiency 0.24 lbs / sq ft ▬ 0% change 80th percentile

Year-Over-Year



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Facility

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STRATEGY #1: BENCHMARKING

Verify KPIs

Verify Facility Information

Validate data reported by operators, utilities, and building systems to produce accurate ranges of performance

Increase quantity of data read by artificial intelligence

Connect data provider API for direct integration

Performance Snapshot

#47966385-21 CEA, Greenhouse/Hybrid/Mixed Light, Grantsville, MD, Climate Zone 5A, July 2020 - June 2021

Get Verified

Whole Facility

Energy

Energy Efficiency 132 kBtu / sq ft ↑ 89% better
Verified

Electric Efficiency 0.552 kBtu / sq ft ↑ 78% better
Verified

Non-Electric Efficiency 132 kBtu / sq ft ↑ 89% better
Verified

Emissions Efficiency 128 kg CO₂e / sq ft ↑ 55% better
Verified

Lighting Efficiency 346 kWh / day ↑ 71% better

Water

Water Efficiency 0.675 gal / sq ft ↑ 26% better

Year-Over-Year



68.1% better

Select a second PowerScore for comparison snapshot or
add another:

#47974091-21, Motown Jun

Create A Copy Of This PowerScore

STRATEGY #1: BENCHMARKING

Document Baselines

Capture Market Practices and Performance

Benchmark a range of production environments to enable development of resource use baselines:

- Energy
- Water
- Emissions

Establish baseline methodology

Understand baselines for different facility and crop types

A selection of crops grown indoors



Greens
leafy greens,
lettuce, spinach



Hops



Insects



Strawberries



Vine Crops
tomatoes, peppers,
cucumbers, eggplants



Flowers
perennials, annuals,
ornamentals



**Microgreens/
herbs**



**Vegetable
Transplants**



Fruits



Cannabis



Commodities
corn, wheat



Other
poultry, forestry
seedlings, algae



Other Vegetables
tubers,
mushrooms



STRATEGY #2

PROMOTING EFFICIENCY BENEFITS

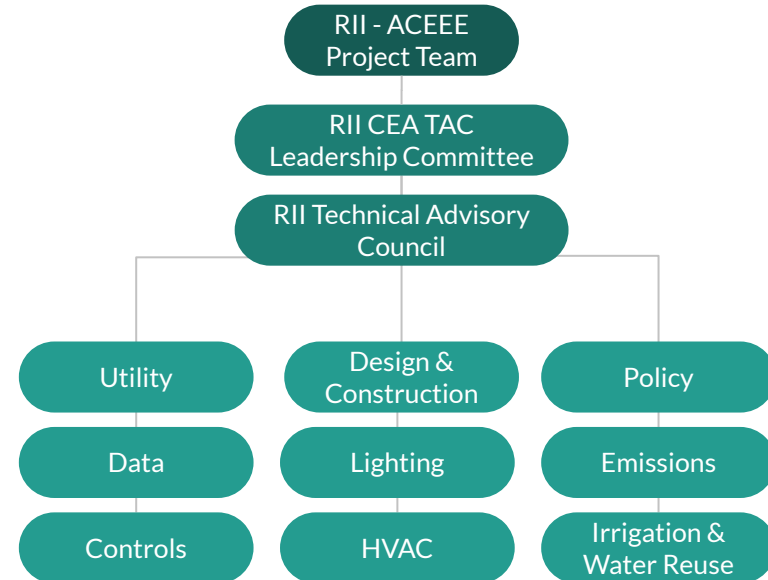
STRATEGY #2: PROMOTING EFFICIENCY BENEFITS

Develop Best Practices Guidance

Promote efficiency benefits in ways that are compelling to producers

New CEA Working Groups:

1. Design & Construction
2. Lighting
3. HVAC
4. Automation & Controls
5. Policy, Codes & Standards
6. Irrigation & Water Reuse



Example Working Group & Charter: Lighting

Objective: To share insights on effective design, installation, and operation of horticultural lighting systems in CEA facilities, help producers optimize integration of high-performance technology and practices, and help utility & efficiency programs support lighting infrastructure and smart lighting strategies.



STRATEGY #2: PROMOTING EFFICIENCY BENEFITS

Launch CEA Working Groups

Working Group	Status	Kickoff Month	Collaboration Months	Peer Review Months	Publication Month	Workshop Month
Utility	Active	Sept 2021	Sept - Nov 2021	Nov-Dec 2021	Feb 2022	Mar 2022
Facility Design & Construction	Active	Oct 2021	Oct 2021 - Feb 2022	Feb-Mar 2022	May 2022	Jun 2022
Lighting	Active	Nov 2021	Nov 2021 - Feb 2022	Feb 2022	Mar 2022	Apr 2022
HVAC	Active	Dec 2021	Dec 2021 - Mar 2022	Feb 2022	Apr 2022	May 2022
Policy	Recruiting	May 2022	May - Dec 2022	Apr, Aug, Dec 2022	Jun & Sep 2022 Jan 2023	Jul & Oct 2022 Feb 2023
Controls	Planning	Apr 2022	Apr - Jun 2022	Jun 2022	Jul 2022	Aug 2022
Irrigation & Water Reuse	Planning	Aug 2022	Aug - Nov 2022	Jan 2023	Feb 2023	Mar 2023

Build Market Capacity



1

Use **industry benchmarks** to establish high-performance baselines for diverse facilities and crop types.

2

Develop and disseminate peer-reviewed **best practices guides** covering key aspects of resource efficient CEA.

3

Develop and present **workshops, webinars, and in-depth tutorial videos** to engage and educate cultivators, contractors, installers.

4

Produce **case studies** to highlight success stories and demonstrate progress.

5

Host curriculum on **virtual classrooms** to continuously educate producers on energy and non-energy benefits.

STRATEGY #2: PROMOTING EFFICIENCY BENEFITS

Engage and Educate Supply Chain Actors

Establish Credentialing Program

Catalog of CEA best practices guidance for project partners:

- Design & Construction
- Lighting
- HVAC
- Automation & Controls
- Irrigation & Water Reuse

Credential achieved upon completion of required coursework

Continuing education required to maintain credential



Best Practices Guides

Live Workshops

Case Studies

Virtual Classrooms

*for Producers and
Project Teams*



STRATEGY #3

SUPPORTING PRODUCERS

STRATEGY #3: SUPPORTING PRODUCERS

Leverage Key Market Actors



Energy Suppliers



Efficiency Programs



State Governments



Consumers



Investors & Financial Institutions



Industry Organizations



Educational Institutions

Barriers to Energy Efficiency



Investors & Financial Institutions

Create Coordinated Producer Support Systems

Provide Understanding, Trust, & Connections

- Emerging technologies can suffer from low producer awareness and trust and efficient products have higher upfront costs
- Connections can help reduce the cost of capital, increase access to education, and offer technical and financial assistance

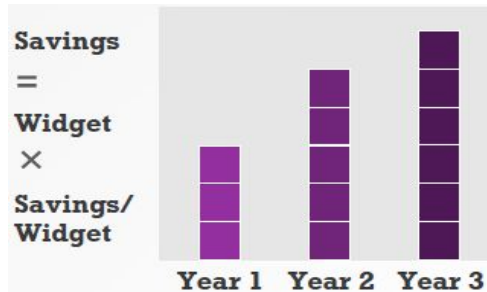
Table 10: Rating of Barriers to Energy Efficiency

Barrier	Rating
Upfront costs	14
Access to capital and financing	9
General lack of knowledge of efficient technologies	8
Skepticism and lack of trust in product performance	8
Lack of executive support for trying something new	4
Not enough cultivator training on how to effectively use technologies	3

Flavors of Efficiency Programs

Resource Acquisition

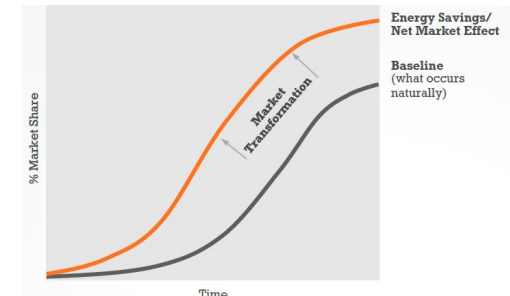
- Achieve near-term savings
- Targeting specific customers
- Incentives in exchange for energy savings
- ✓ Smaller program scope and scale
- ✓ Greater level of program control
- ✓ Simpler evaluation for program administrator and regulators



Efficiency Programs

Market Transformation

- Long-term savings through structural change
- Target customers and supply chain
- Use multiple market interventions
- ✓ Broad scope of participants and activities
- ✓ PAs have limited control in a dynamic market
- ✓ Evaluation is messier and requires longer planning and measurement timeframe



Role of Efficiency Programs in MT



Efficiency Programs

Mobilize the market

- Provide incentives to address cost barriers
- Coordinate with supply chain to increase market availability and access
- Offer training and technical assistance to develop workforce
- Conduct demonstrations to prove technology, build confidence, and address perceived risks
- Leverage national recognition programs

Evaluate, measure, verify savings

- Market baseline: energy performance, equipment types/efficiency
- Indicators of market progress and structural change
 - Increases in stocking/sales; voluntary program recognition
 - Lock-in through codes and standards
- Program attribution: participation, free riders, spillover
- Cumulative energy impact

STRATEGY #3: SUPPORTING PRODUCERS

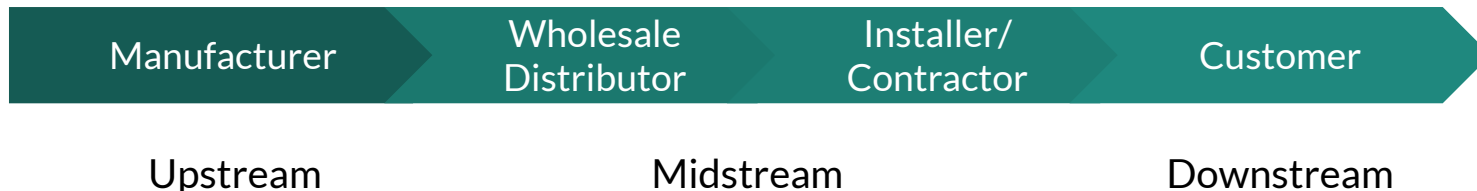
Incentives for Efficient Technology



Efficiency Programs

Incentives Address First Cost Barriers

Effective programs target incentives to the right market actors to maximize market impact



Example CEA technologies with efficiency incentives:

- Energy screens / shade curtains
- Horticultural light fixtures
- HVAC and dehumidification equipment
- Controls hardware and software for lighting and HVAC systems

STRATEGY #3: SUPPORTING PRODUCERS

CEA Technology Purchasing



Efficiency Programs

Targeting Incentives for CEA Technology

Upstream:

- Strong option for all technology types

Midstream:

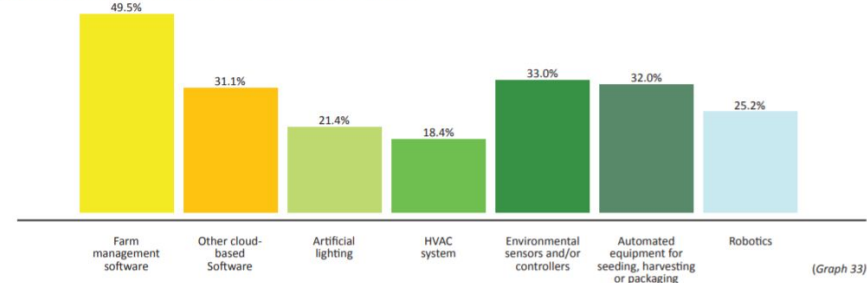
- Important for lighting, water management, controls & automation

Downstream:

- HVAC uniquely suited to upstream and downstream

Technology Type	Influencer: Technology Manufacturers	Influencer: Manufacturer Sales Representatives	Influencer: Technology Distributors	Influencer: CEA Facility Staff
Horticultural Lighting	X	X	X	
HVAC	X			X
Water Management	X		X	
Controls & Automation	X	X	X	

Technology solutions being considered in the next 12 months



(Graph 33)

STRATEGY #3: SUPPORTING PRODUCERS

Robust Standards for CEA

Convene Key Market Actors to Develop Standards

Effective industry standards enable:

- Testing of emerging technologies
- Third-party certification of equipment
- Specification of minimum efficiency requirements in regulations and energy codes
- Sharing of industry standard practice and high-performance strategies by educational organizations



Industry Organizations



State Governments



Educational Institutions

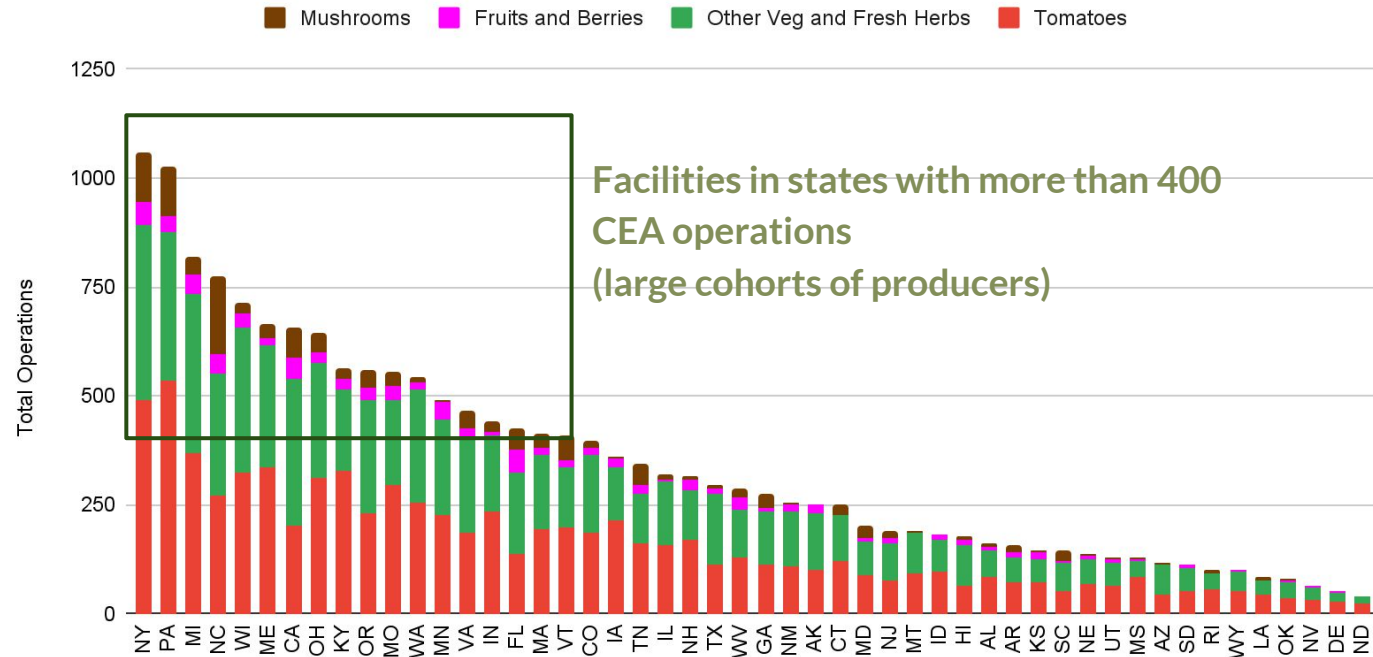


SECTION 03

TARGETING PRODUCERS

Targeting Producers: Food State Operations Under Protection

Food: Total Farm Operations Under Glass or Other Protection (2017)



Note: Minimum of \$1,000 sales to be counted. States with too few respondents, (D) or -, counted as 0

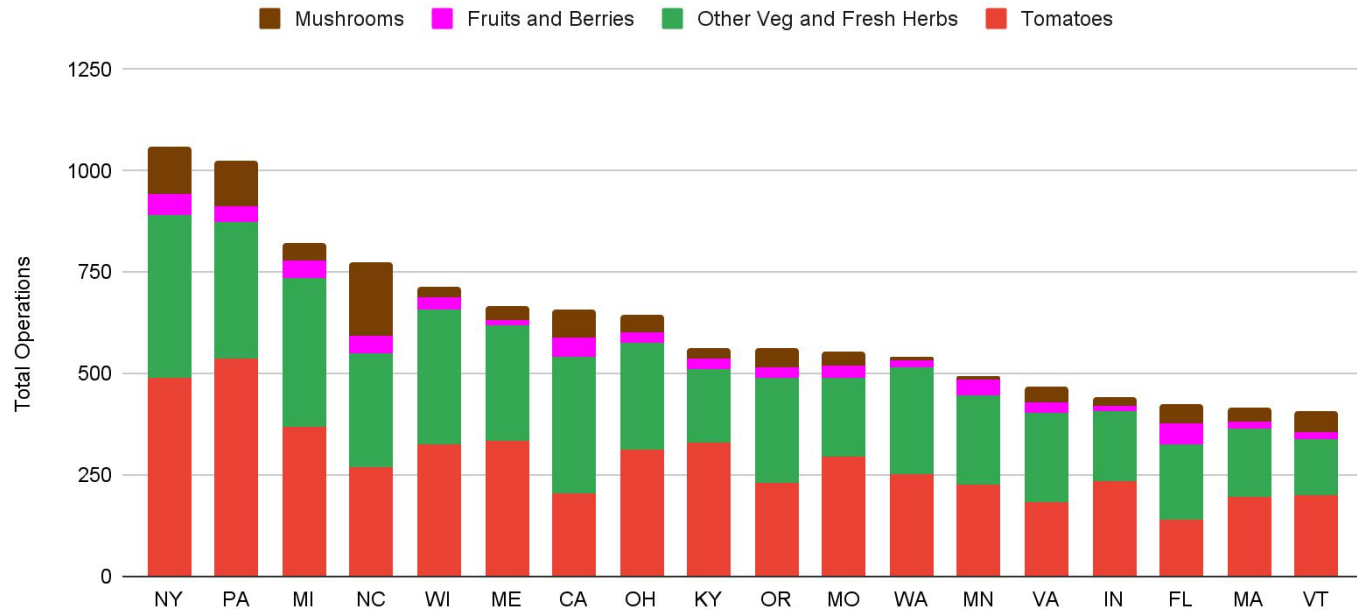
- Categories:
- Family or Individual
 - Partnership
 - Corporation
 - Other
- Estate, trust, prison farm, grazing association, American Indian Reservation

Targeting Producers: Food State Operations Under Protection

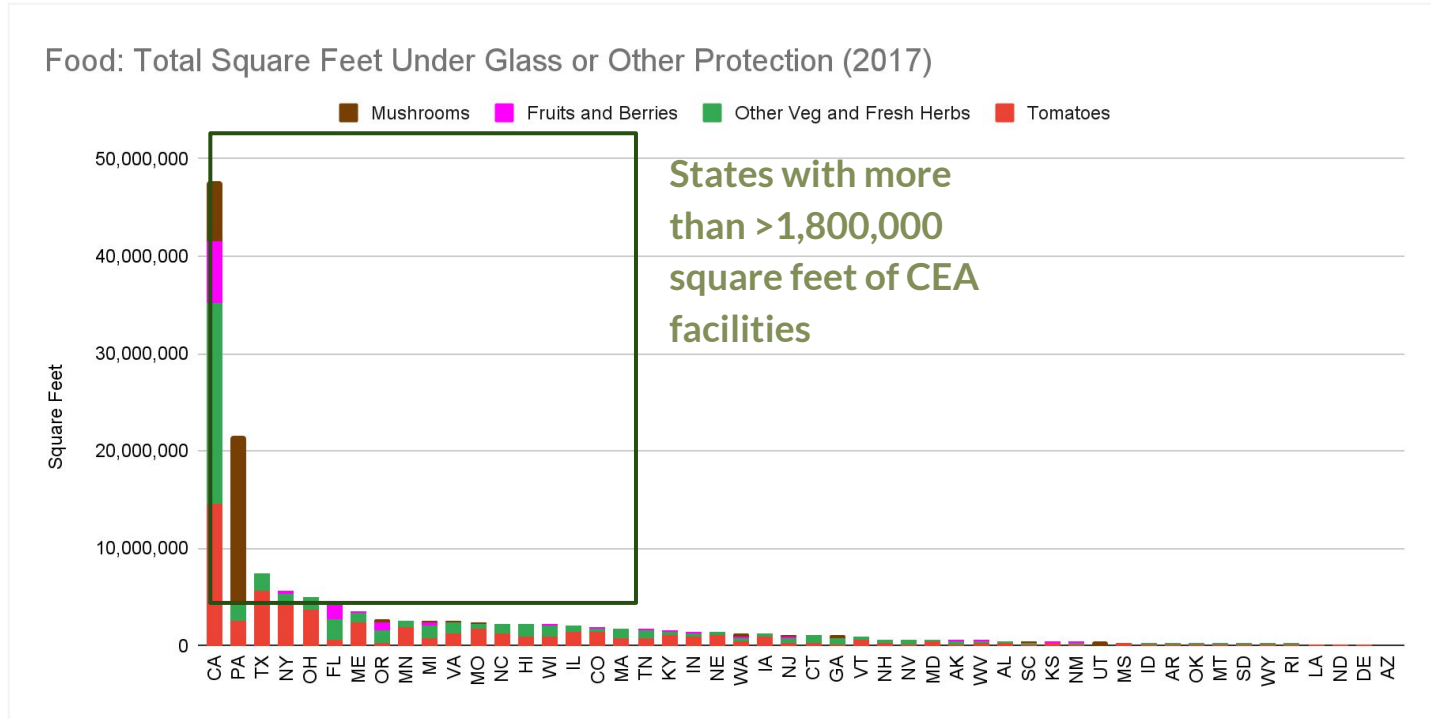
Priority
states:

1. NY
2. PA
3. MI
4. NC
5. WI
6. ME
7. CA
8. OH
9. KY
10. OR
11. MO
12. WA
13. MN
14. VA
15. IN
16. FL
17. MA
18. VT

Food: Total Farm Operations Under Glass or Other Protection, Over 400 Operations (2017)



Targeting Producers: Food Square Feet Under Protection

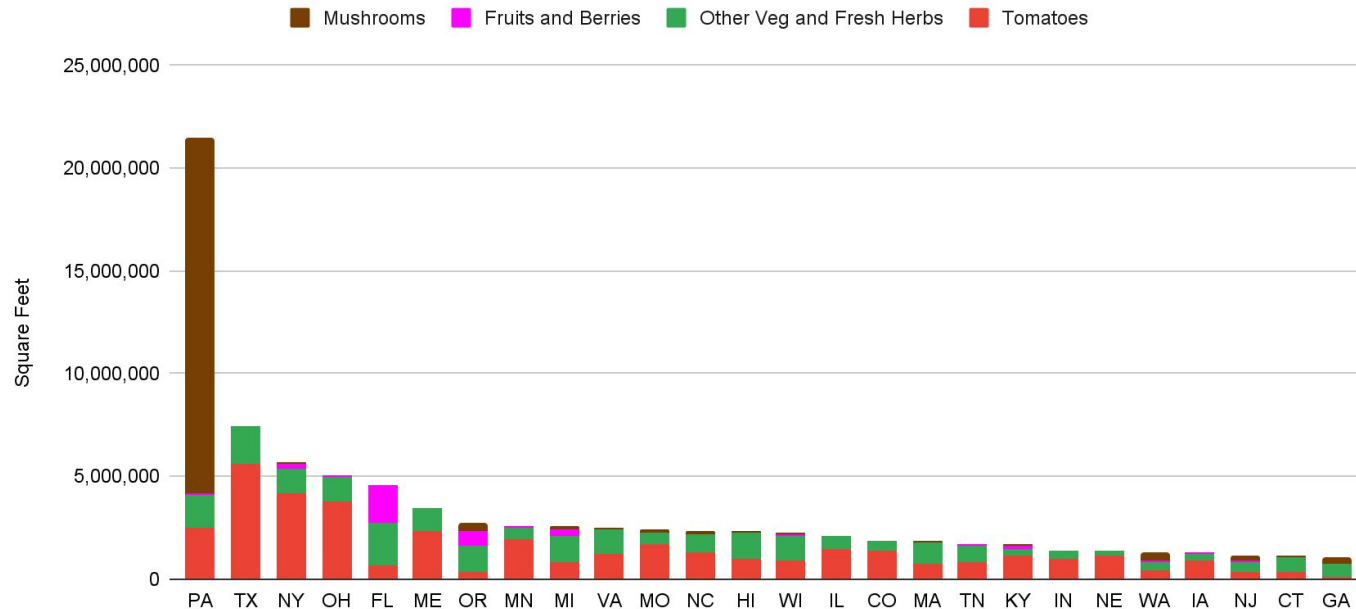


Targeting Producers: Food Square Feet Under Protection

Priority
states:

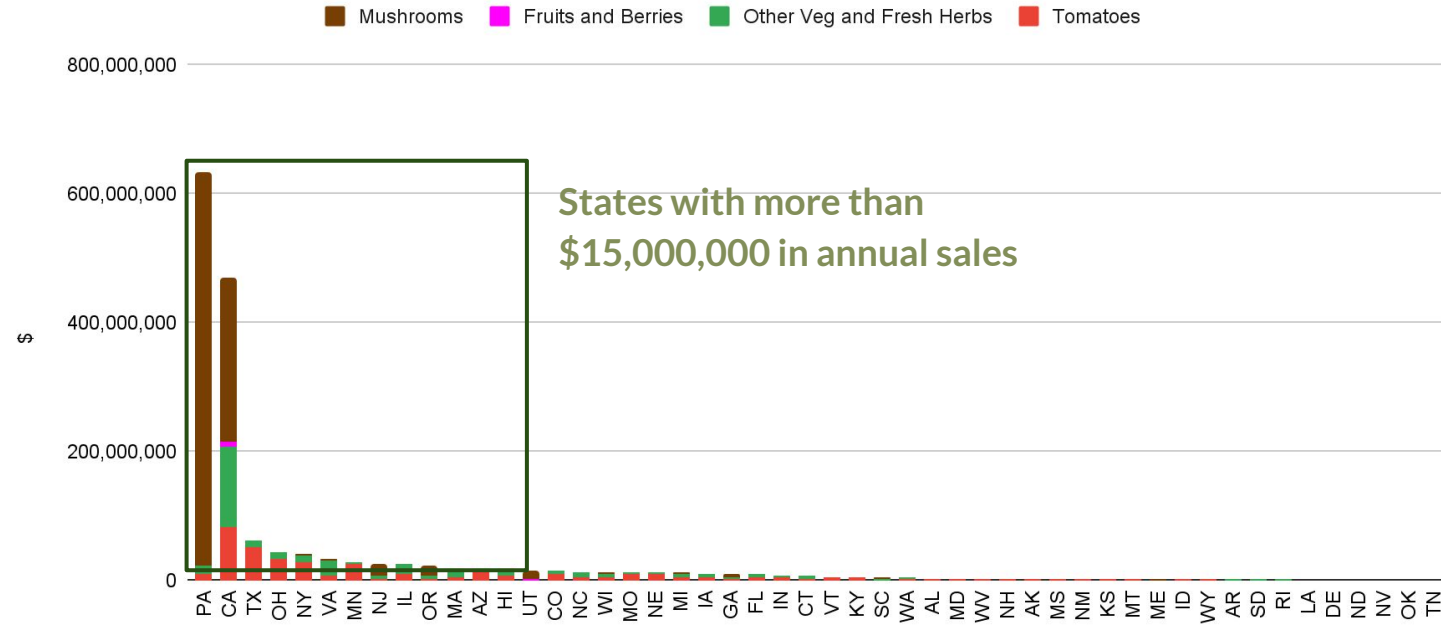
1. CA
2. PA
3. TX
4. NY
5. OH
6. FL
7. ME
8. OR
9. MN
10. MI
11. VA
12. MO
13. NC
14. HI
15. WI
16. IL
17. CO
18. MA

Food: Square Feet Under Glass or Other Protection, Over 1.8 million sqft Excluding CA (2017)



Targeting Producers: Food Sales Volume of Operations Under Protection

Total Dollar Value of Sales from Crops Grown Under Glass or Other Protection (2017)

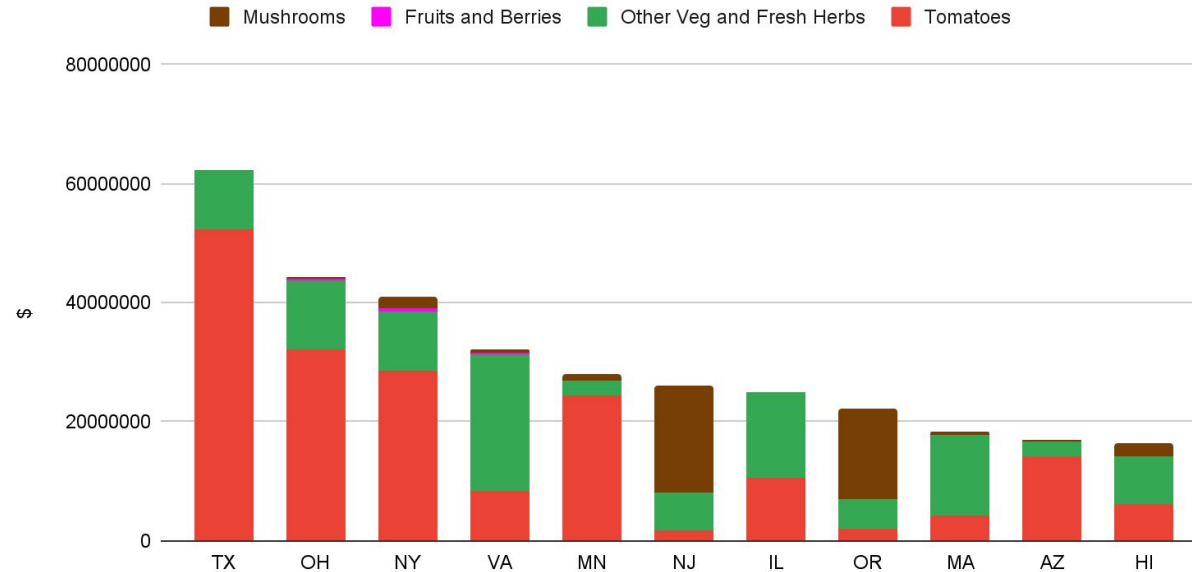


Targeting Producers: Food Sales Volume of Operations Under Protection

Priority
states:

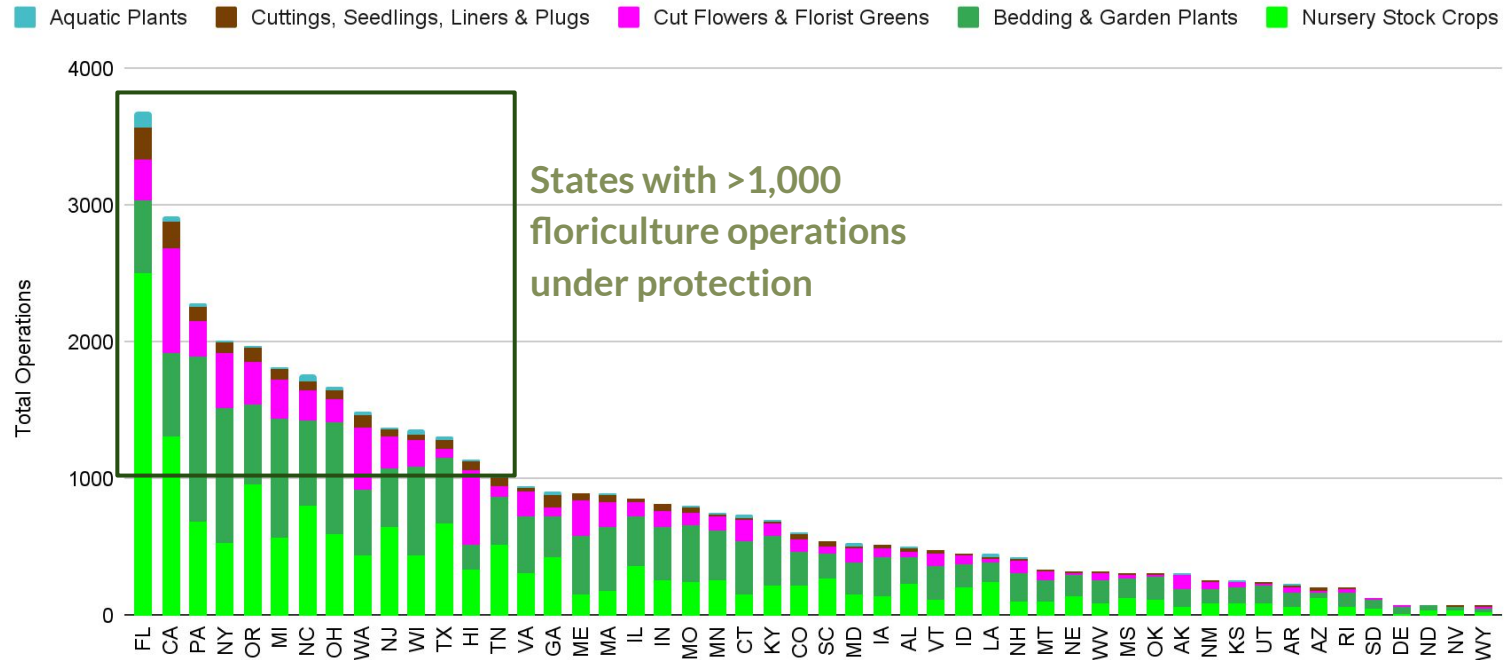
1. PA
2. CA
3. TX
4. OH
5. NY
6. VA
7. MN
8. NJ
9. IL
10. OR
11. MA
12. AZ
13. HI

Total Dollar Value of Sales from Crops Grown Under Glass or Other Protection
With Over \$15,000,000 in Sales Excluding CA & PA (2017)



Targeting Producers: Floriculture Operations Under Protection

Floriculture: Total Farm Operations Under Glass or Other Protection (2017)

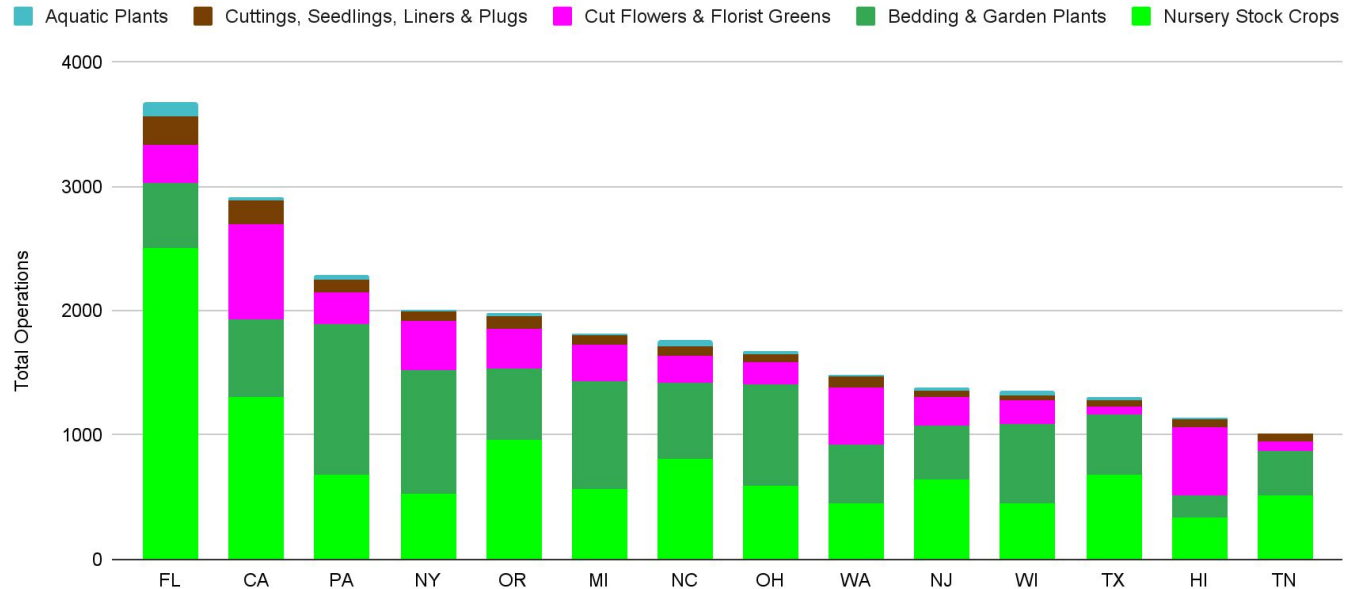


Targeting Producers: Floriculture Operations Under Protection

Priority
states:

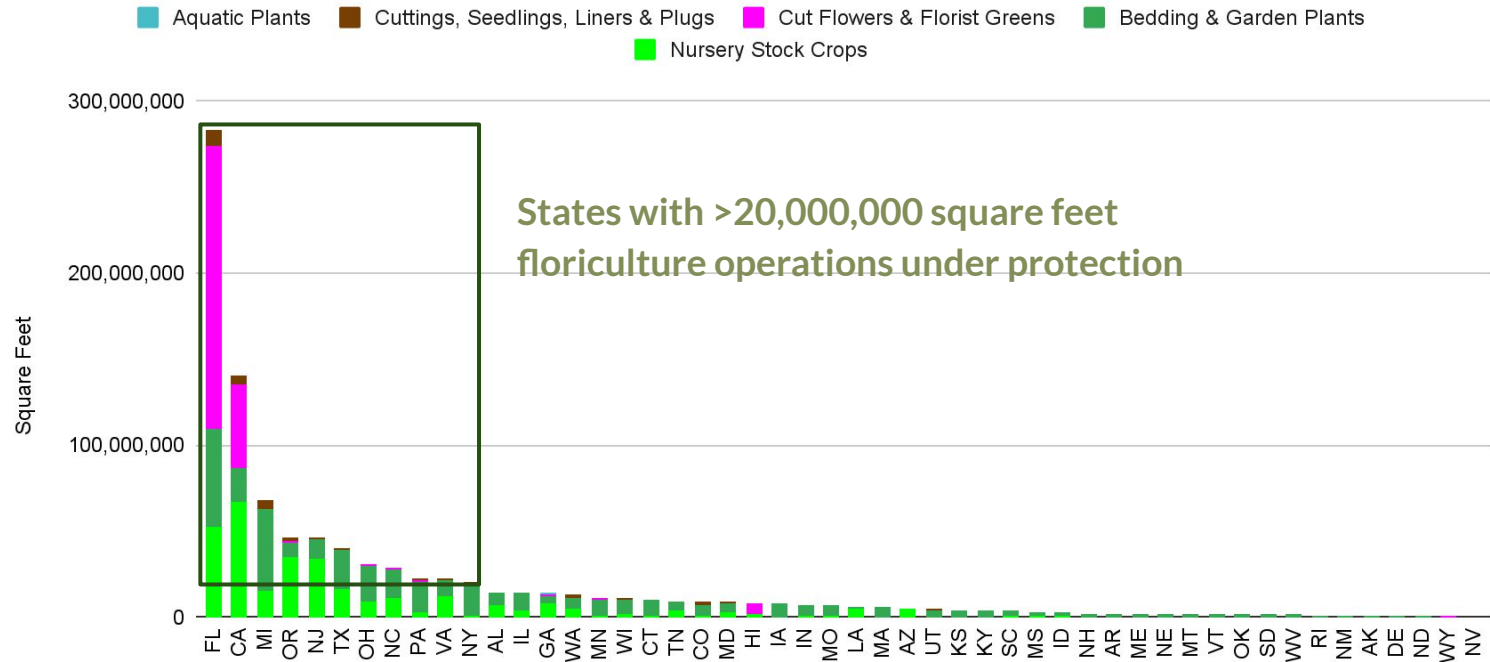
1. FL
2. CA
3. PA
4. NY
5. OR
6. MI
7. NC
8. OH
9. WA
10. NJ
11. WI
12. TX
13. HI
14. TN

Floriculture: Farm Operations Under Glass or Other Protection, Over 1,000 Operations (2017)



Targeting Producers: Floriculture Square Feet Under Protection

Floriculture: Total Square Feet of Operations Under Glass or Other Protection (2017)

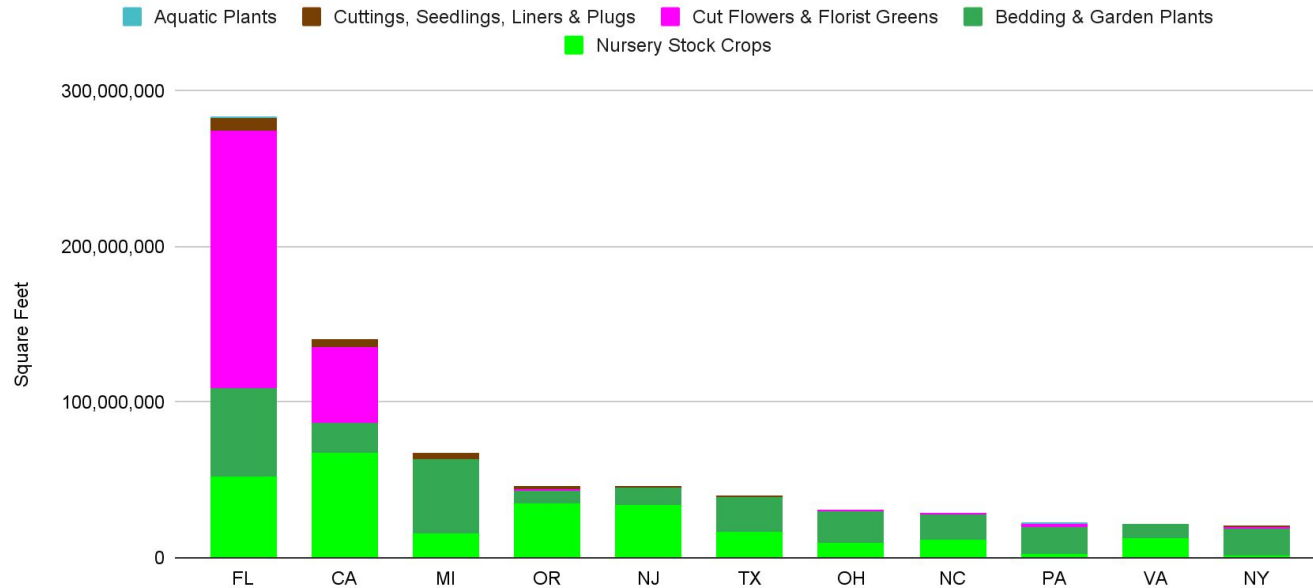


Targeting Producers: Floriculture Square Feet Under Protection

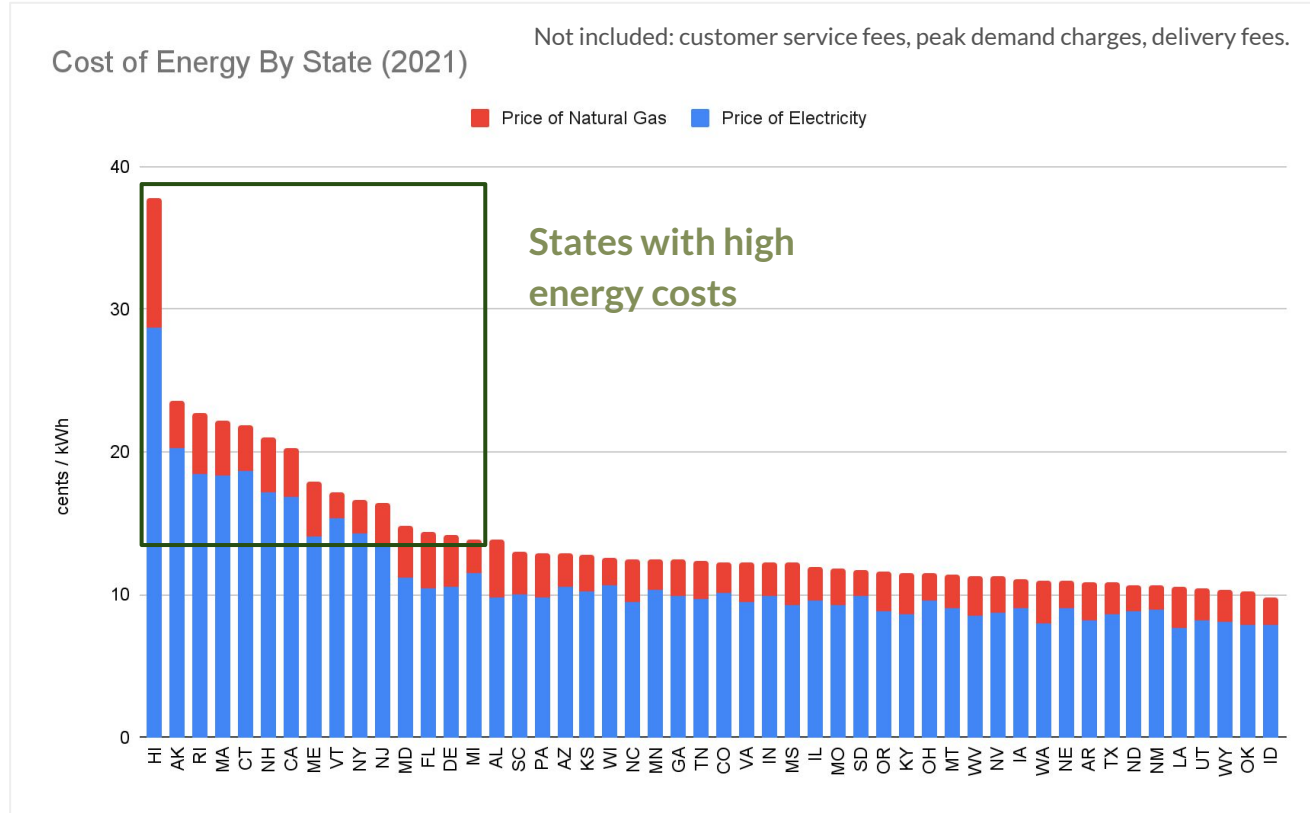
Priority
states:

1. FL
2. CA
3. MI
4. OR
5. NJ
6. TX
7. OH
8. NC
9. PA
10. VA
11. NY

Floriculture: Total Square Feet Under Glass or Other Protection, Over 20 Million sqft (2017)



Targeting Producers: Cost of Energy

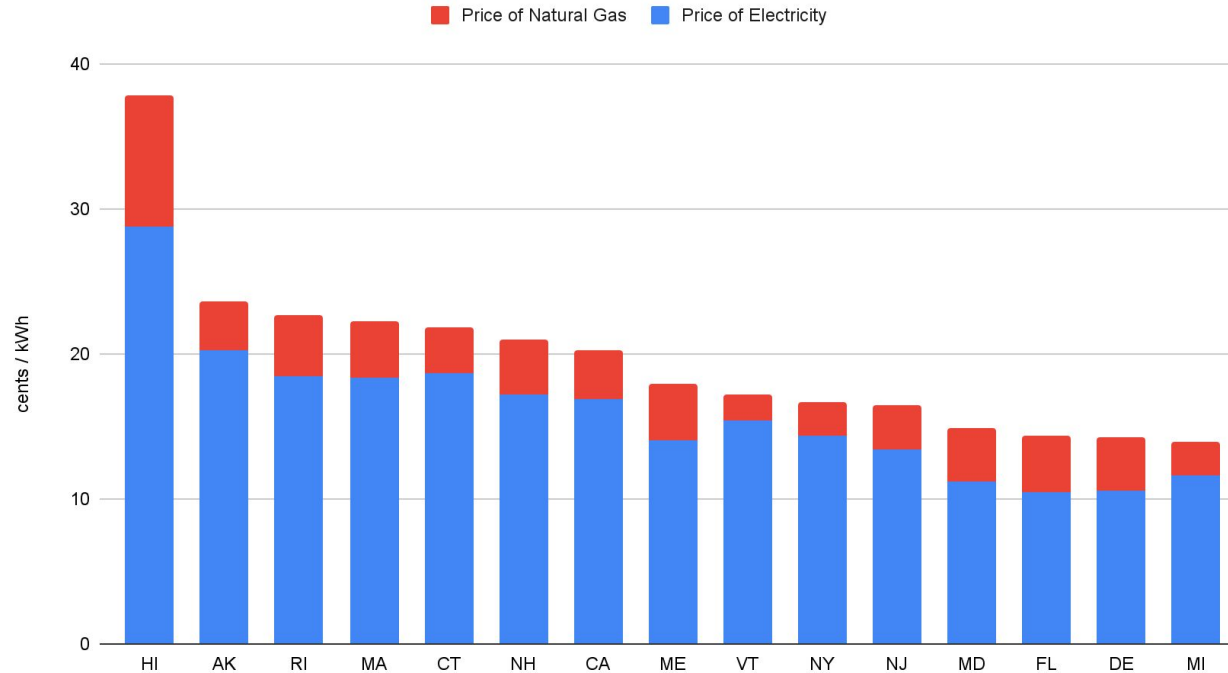


Targeting Producers: Most Expensive Energy

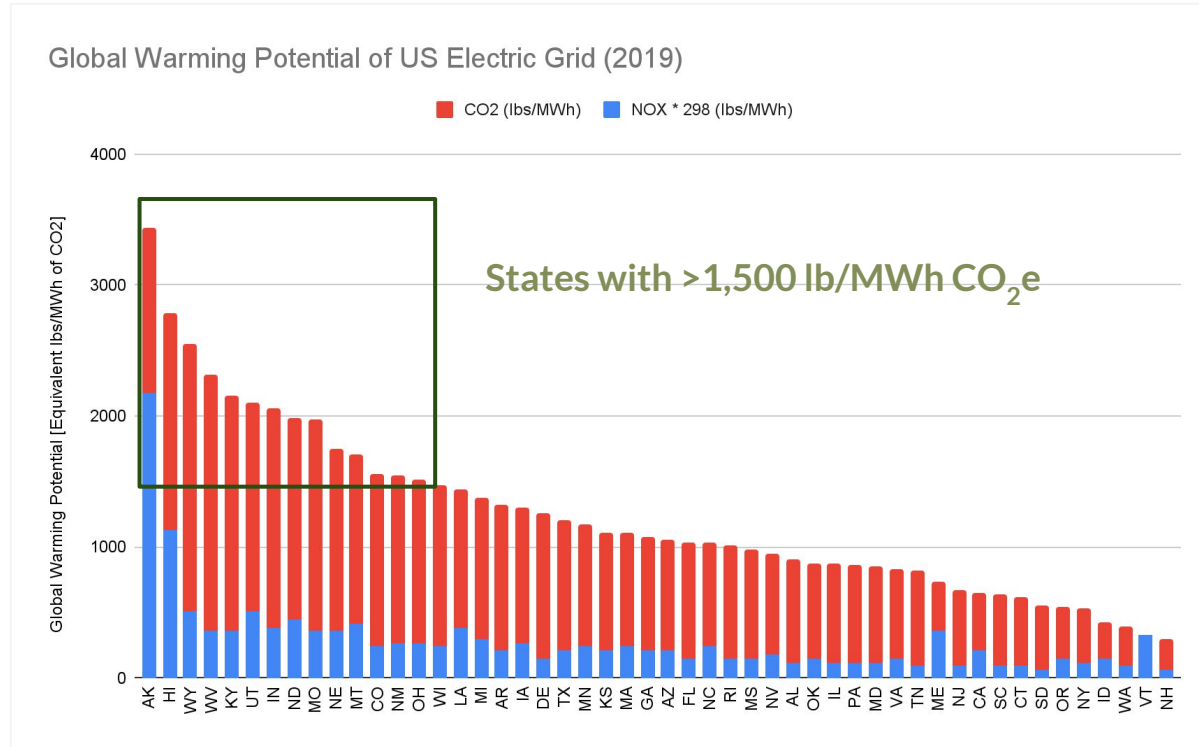
Priority
states:

1. HI
2. AK
3. RI
4. MA
5. CT
6. NH
7. CA
8. ME
9. VT
10. NY
11. NJ
12. MD
13. FL
14. DE
15. MI

Cost of Energy By State, Top 15 States Ranked (2021)



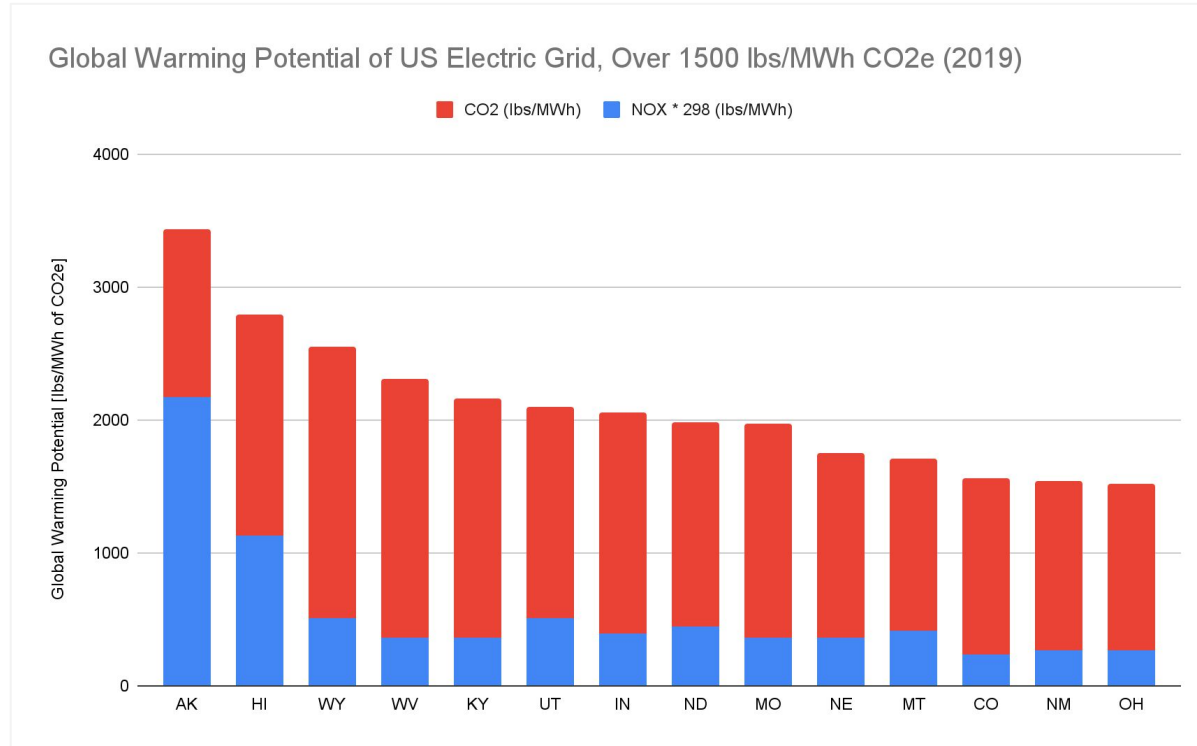
Targeting Producers: Greatest GHG Emissions from Electricity



Targeting Producers: Greatest GHG Emissions from Electricity

Priority
states:

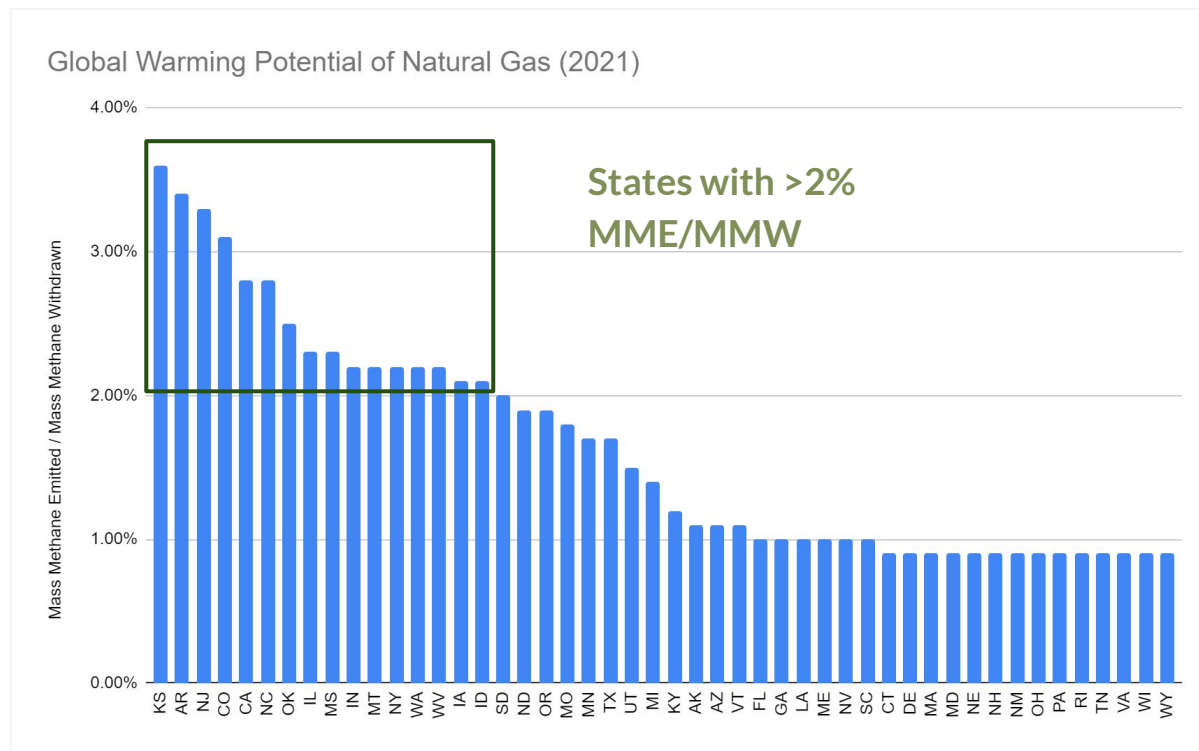
1. AK
2. HI
3. WY
4. WV
5. KY
6. UT
7. IN
8. ND
9. MO
10. NE
11. MT
12. CO
13. NM
14. OH



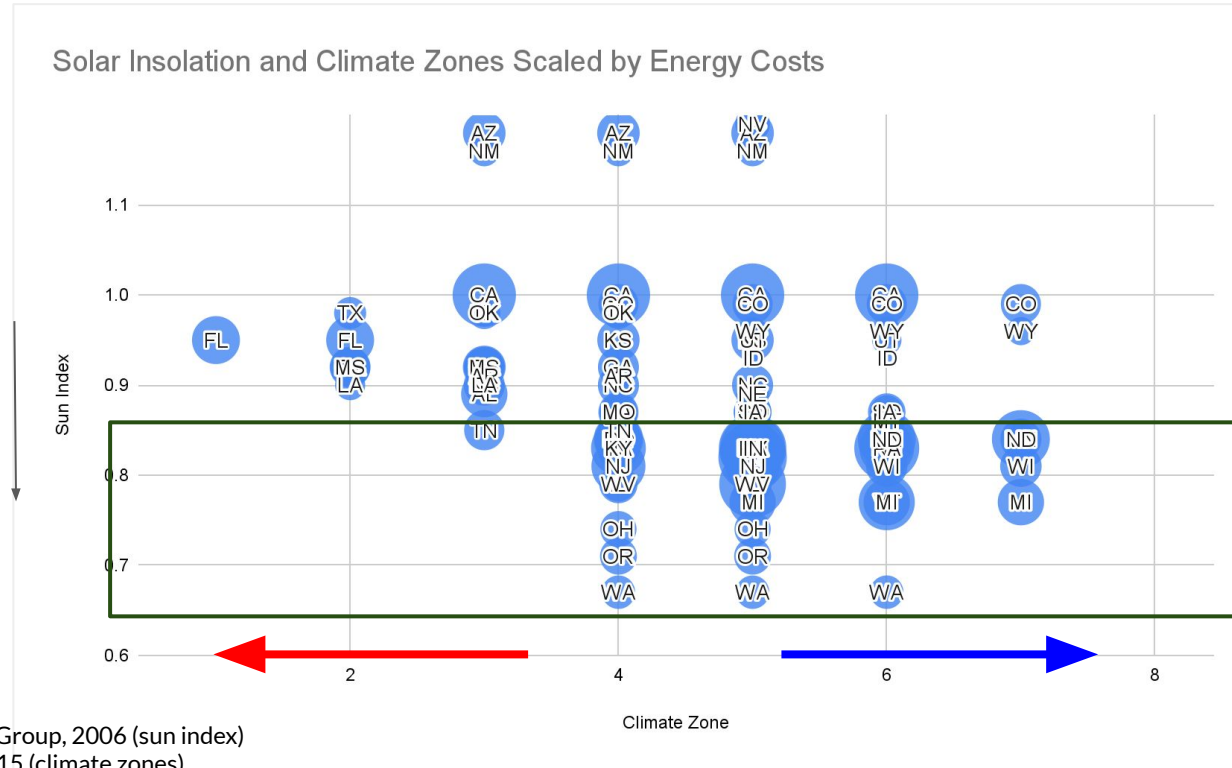
Targeting Producers: Greatest GHG Emissions from Natural Gas

Priority
states:

1. KS
2. AR
3. NJ
4. CO
5. CA
6. NC
7. OK
8. IL
9. MS
10. IN
11. MT
12. NY
13. WA
14. WV
15. IA
16. ID



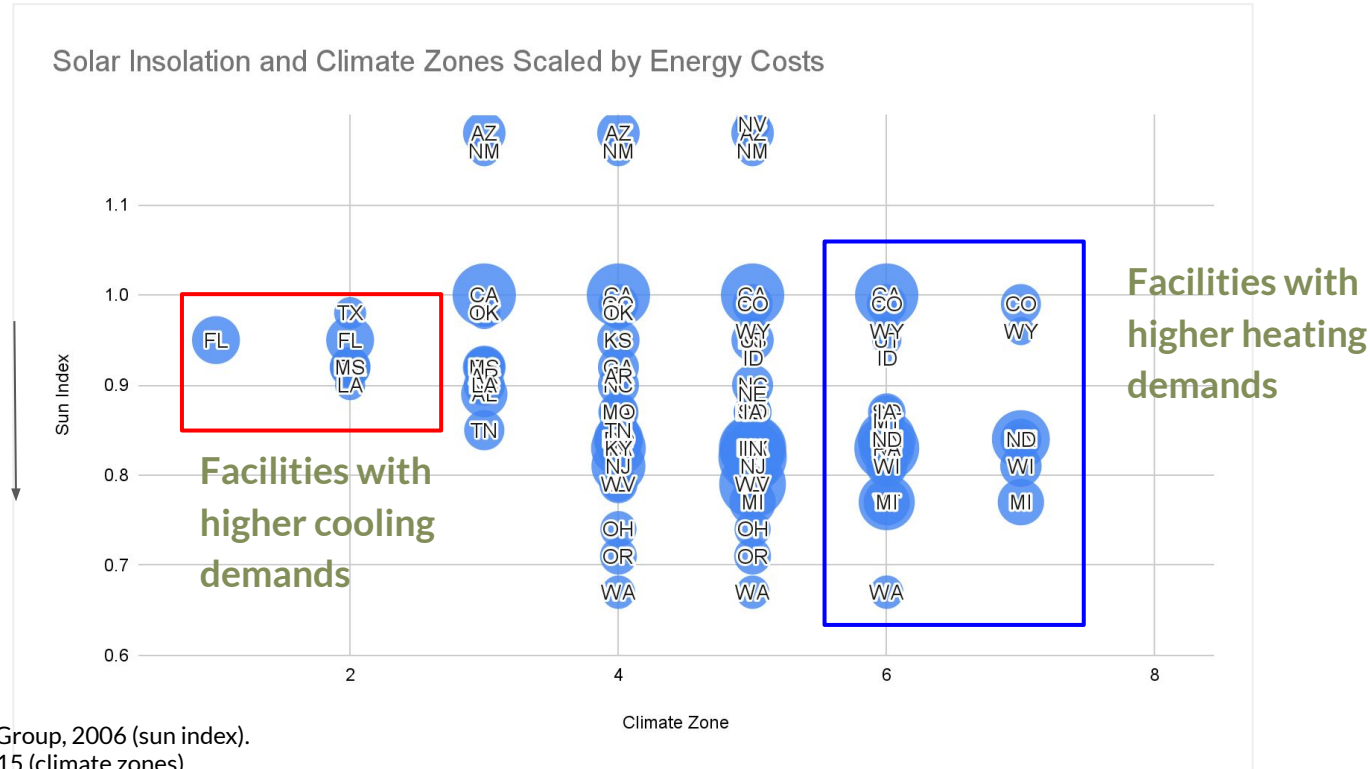
Targeting Producers: Demand for Lighting & HVAC



Facilities in
locations with low
solar resource

Data credit: Toplevel Strategy Group, 2006 (sun index)
US Department of Energy, 2015 (climate zones)
EIA, 2021 (energy costs)
Note: AK and HI excluded as outliers for data visualization.

Targeting Producers: Demand for Cooling & Heating

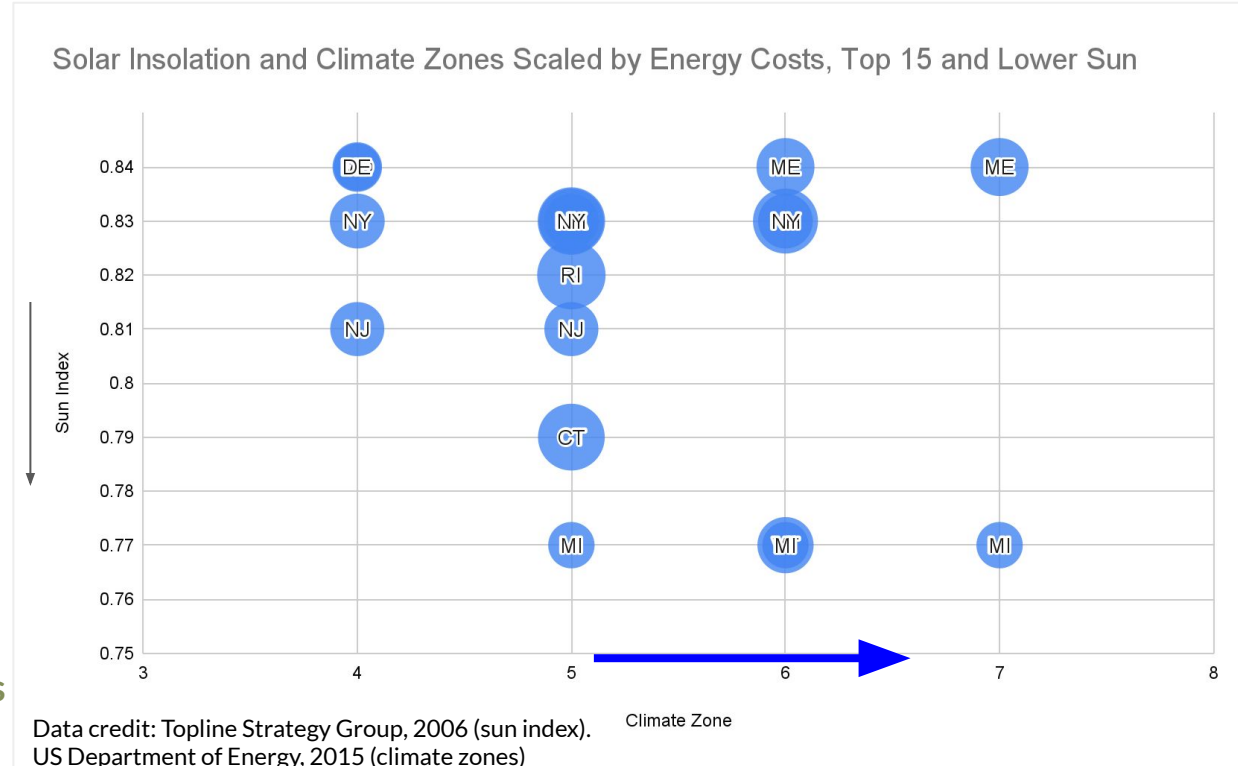


Data credit: Toplevel Strategy Group, 2006 (sun index).
 US Department of Energy, 2015 (climate zones)
 EIA, 2021 (energy costs)
 Note: AK and HI excluded as outliers for data visualization.

Targeting Producers: Greatest Demand for Lighting & HVAC

Priority states:

1. RI
2. MA
3. CT
4. NH
5. ME
6. VT
7. NY
8. NJ
9. MD
10. DE
11. MI



Data credit: Topline Strategy Group, 2006 (sun index).

US Department of Energy, 2015 (climate zones)

EIA, 2021 (energy costs)

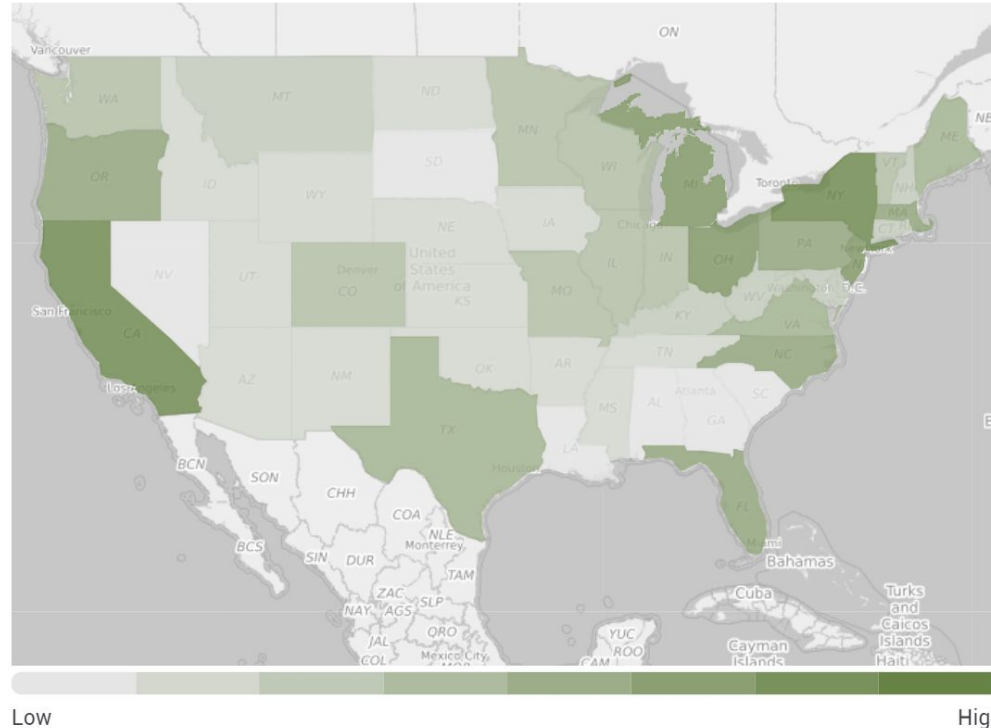
Note: AK and HI excluded as outliers for data visualization.

States with large
cohorts of producers
with large sales volumes
with demand for
lighting and HVAC

Targeting Producers: Target States

Priority
states:

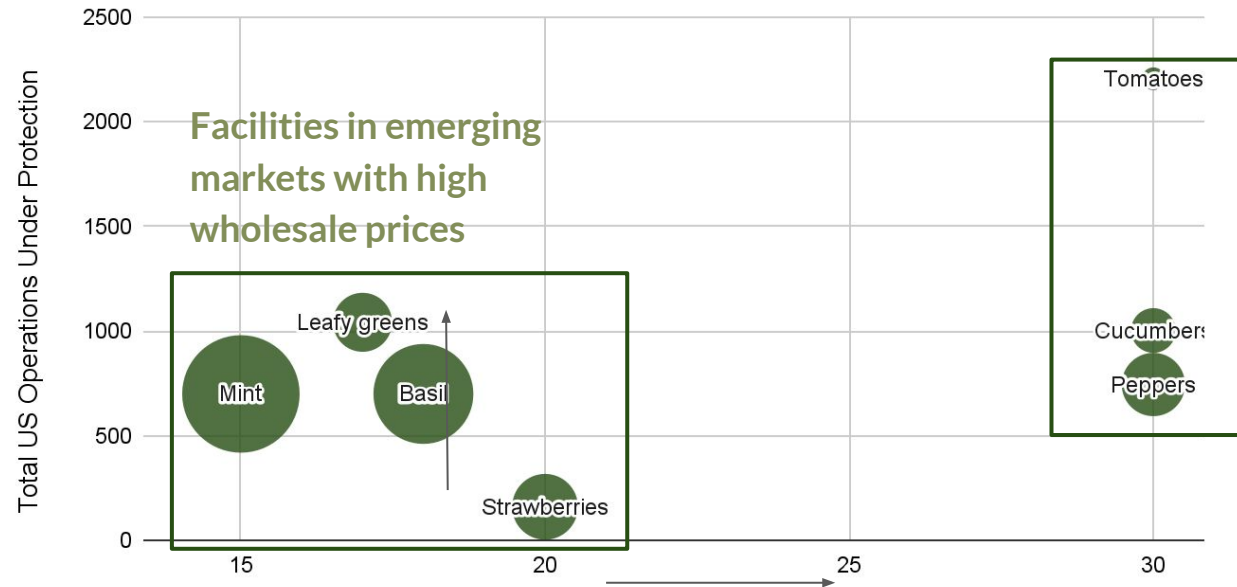
1. NY
2. CA
3. MI
4. NJ
5. OH
6. FL
7. HI
8. MA
9. NC
10. OR
11. PA
12. ME
13. TX
14. VA
15. CO



Leaflet | Map data by OpenStreetMap, under ODbL.

Targeting Producers: Greenhouse Producers

Greenhouse DLI Targets and Total Operations Scaled by Wholesale Price Per Pound



Large cohort of facilities

Facilities with greater need for supplemental lighting

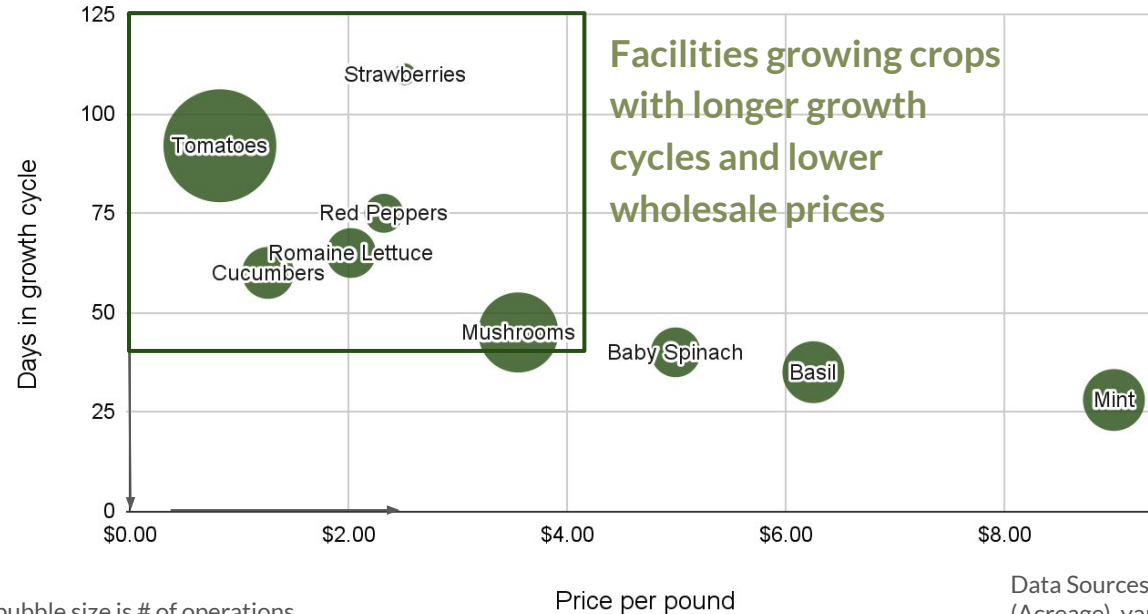
Note: both Mint and Basil are plotted using the # of operations for “herbs”, both were plotted to accent range for herbs

DLI Target [mol/ m2/ day]

Data Sources: USDA 2019 (# Operations), USDA 2021 (pricing), various sources for DLI

Targeting Producers: Faster Harvests & Higher Prices

Price vs Growth Cycle Scaled by Total US Acreage Under Protection

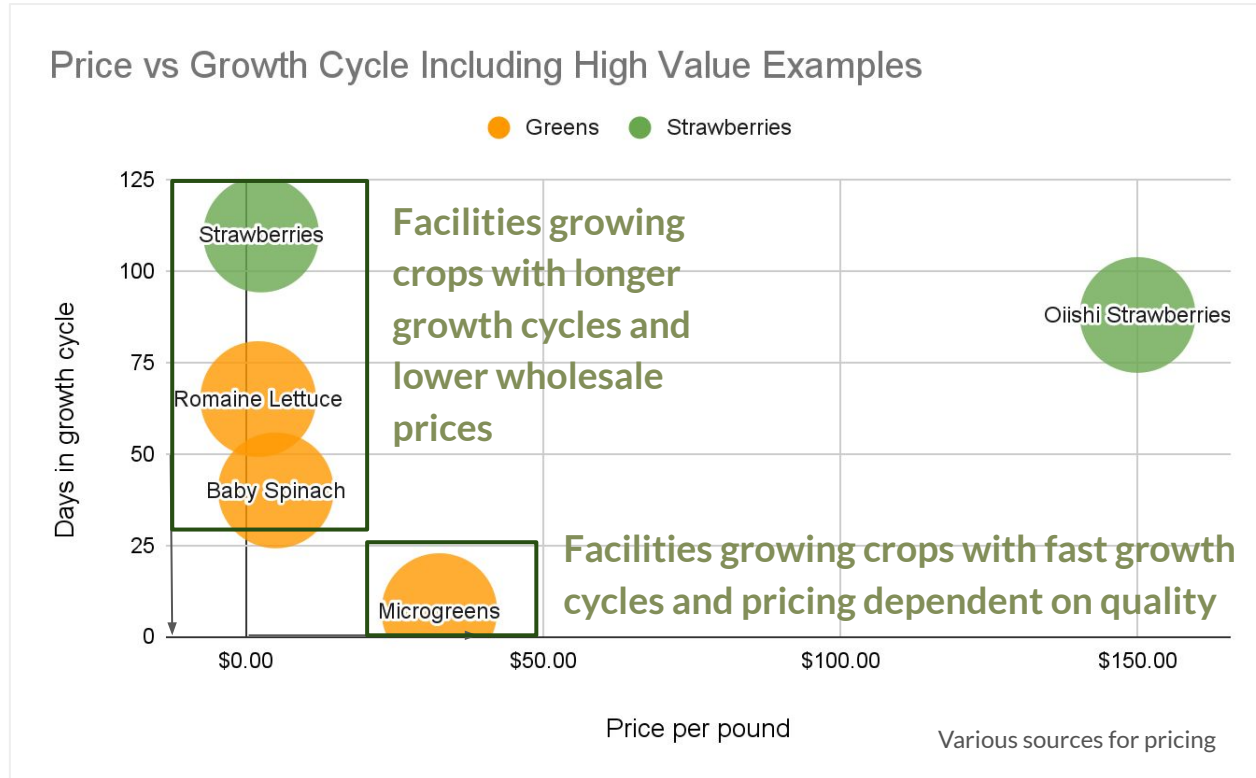


Note: both Mint and Basil bubble size is # of operations for "herbs", both were plotted to accent range for herbs.

Data Sources: USDA, 2021 (pricing), USDA, 2019 (Acreage), various sources for days in cycle

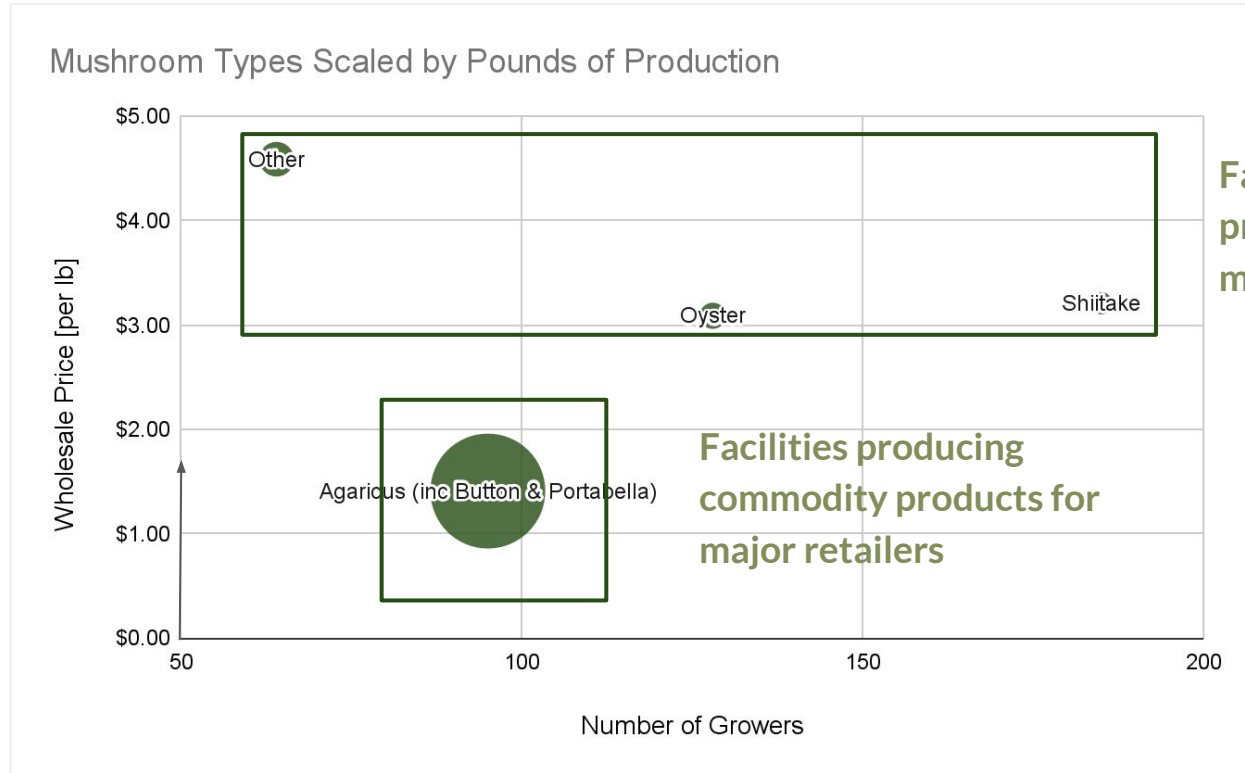
Moving cultivation into controlled environments, crops can be grown out of season, which increases wholesale price

Targeting Producers: High Quality, High Prices



As quality increases in CEA production, wholesale price also increases, especially for indoor producers

Targeting Producers: Mushrooms



Data Source: USDA, 2019 (table)

Demand for edible mushrooms of culinary value has a CAGR of 8.7% 2020 - 2027

Business Wire, 2021 (CAGR)

Targeting Producers: Priority Crops

Higher
Priority



Lower
Priority

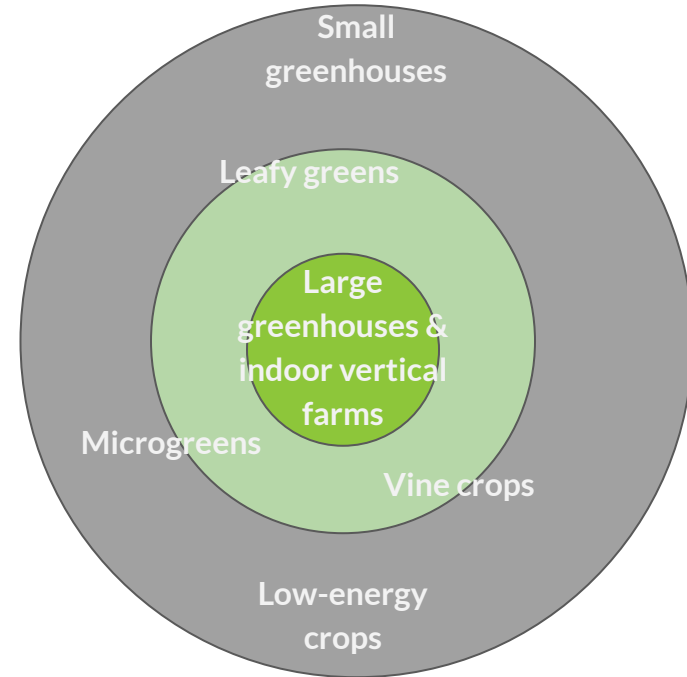
Crop	Class
Vine crops	<i>Tomatoes</i>
Mushrooms	<i>Mushrooms</i>
Floriculture	<i>Nursery stock crops</i>
Vegetables and herbs	<i>Leafy greens</i>
Vegetables and herbs	<i>Microgreens</i>
Vegetables and herbs	<i>Fresh herbs</i>
Vine crops	<i>Cucumbers</i>
Vegetables and herbs	<i>Peppers</i>
Floriculture	<i>Finished bedding crops</i>
Berries	<i>Strawberries</i>
Berries	<i>Other berries</i>
Cannabis	<i>Hemp</i>

Targeting Producers: Type & Size of Facility

Value of Efficiency Varies

Influenced by:

- Facility Size
- Facility Type
- Crop Type
- Energy Demand of Crop

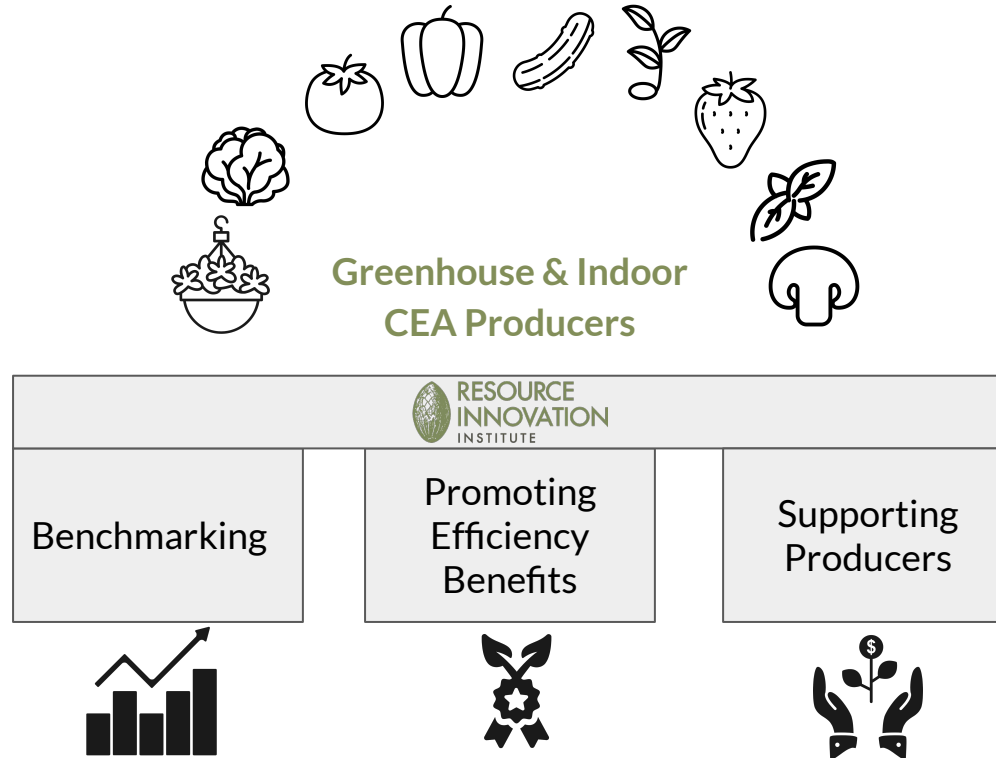


A background image showing numerous small green seedlings growing in black plastic trays filled with dark soil. The seedlings are arranged in rows, and the image has a slightly blurred, high-angle perspective.

SECTION 04

IMPLEMENTATION PLAN

CEA Market Transformation Implementation Plan



Initiatives on the Horizon

Follow Us. Get Involved!



Spring

Benchmarking services for producers and CEA facilities
Recruiting for CEA Leadership Committee

Summer

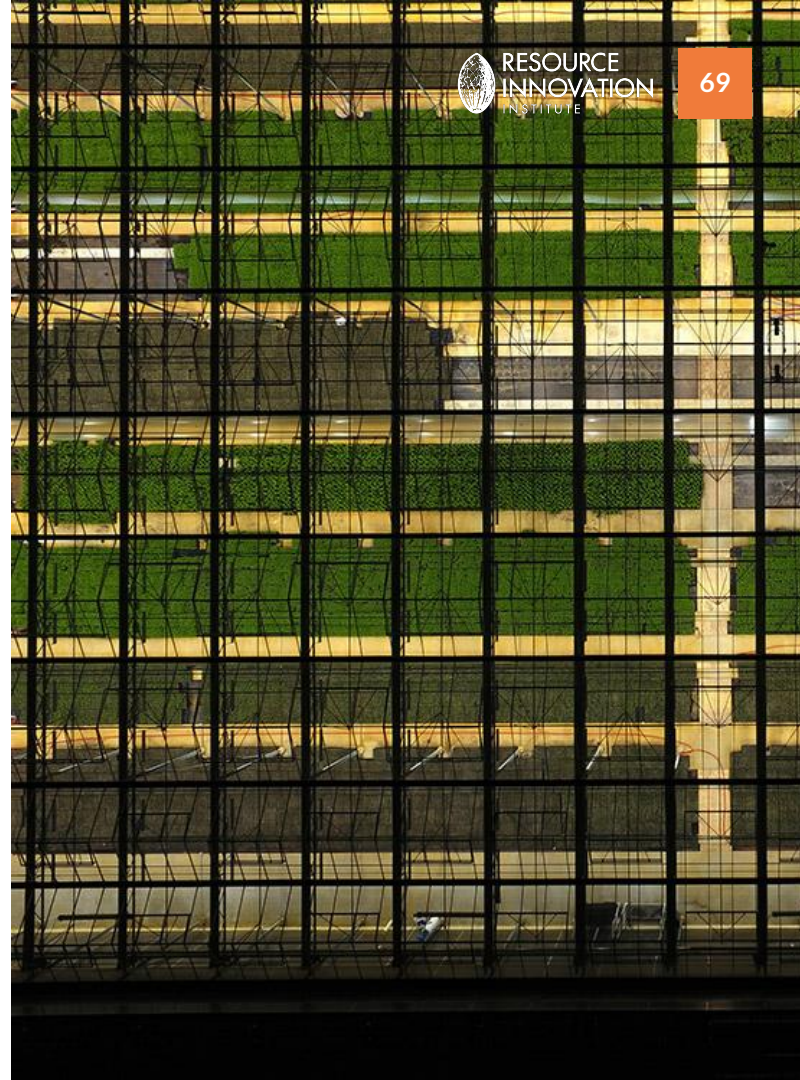
CEA best practices
Strategic energy management, KPIs, and baselines

Autumn

Credentialing Program for CEA professionals & experts

Winter

Roadmap for CEA Facility Certification System
CEA Policy & Utility Conference early November



Benchmark with PowerScore

Become a CEA Partner Today!

Get your free

- Performance Snapshots
- Producer Resource Efficiency Plan
- Case Study

Contact Gretchen@ResourceInnovation.org to get started.

Performance Snapshot

#47966385-21 CEA, Greenhouse/Hybrid/Mixed Light, Grantsville, MD, Climate Zone 5A, July 2020 - June 2021

Get Verified

Whole Facility

Energy

Energy Efficiency 132 kBtu / sq ft ↑ 89% better



Electric Efficiency 0.552 kBtu / sq ft ↑ 78% better



Non-Electric Efficiency 132 kBtu / sq ft ↑ 89% better



Emissions Efficiency 128 kg CO₂e / sq ft ↑ 55% better



Lighting Efficiency 346 kWh / day ↑ 71% better

Water

Water Efficiency 0.675 gal / sq ft ↑ 26% better

Year-Over-Year



68.1% better

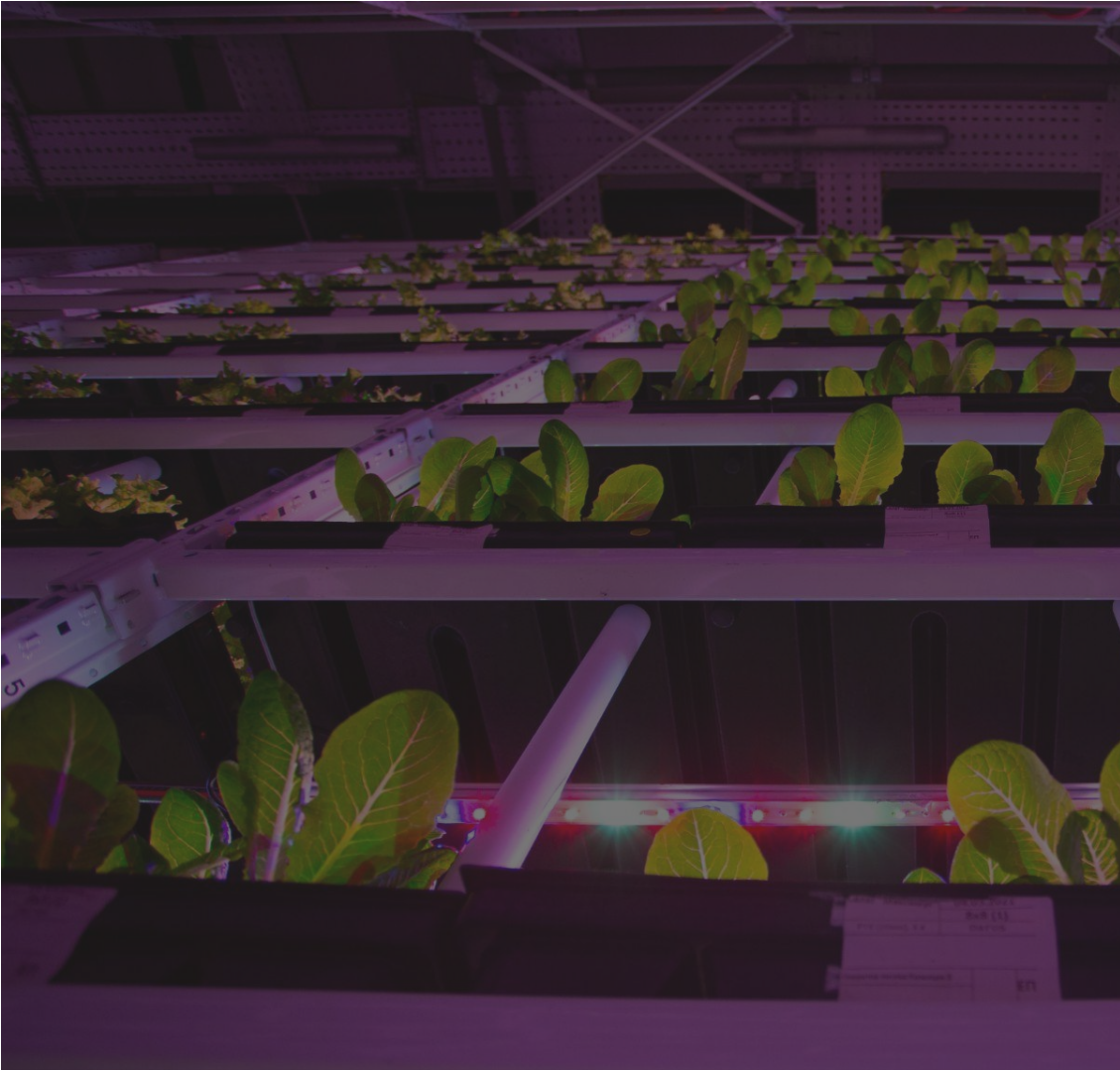
Select a second PowerScore for comparison snapshot or
add another:

#47974091-21, Motown Jun

Create A Copy Of This
PowerScore

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Acknowledgements and Suggested Citation

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<https://catalog.resourceinnovation.org/item/controlled-environment-agriculture-market-transformation-strategy-446270>.