

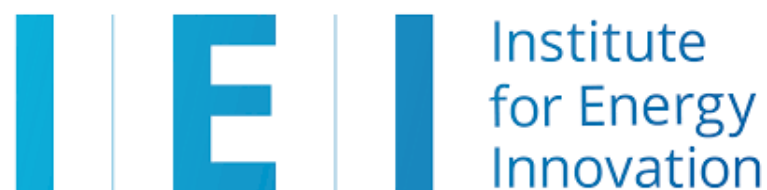


**Michigan Commercial & Industrial
SOLAR Market Assets, Gaps & Recommendations**

**EGLE Michigan Clean Energy Assets Roadmap Program
September 2022**



Thanks to Our Partners





Introduction

In the fall of 2022, the Michigan Energy Office (MEO) within the EGLE commissioned a study to support Governor Whitmer's administration's MI Healthy Climate Plan to reduce greenhouse gas emissions by 2050 and "illuminate the existing assets and gaps Michigan has in its renewable energy policies and its supply and value chains that may impact the further adoption of these clean energy technologies."

This report focuses on identifying the supply-side assets/gaps and demand-side impediments of Michigan's commercial and industrial (C&I)* solar PV markets, as well as provide recommendations to improve the adoption of C&I solar PV.

Our aim is "to provide information critically needed by EGLE that will enable it to address policy, workforce development and value chain gaps impeding the adoption of clean energy resources and prohibiting the growth of manufacturing, developing projects, installing and servicing these resources."

** For this study, the definition of the "Commercial and Industrial" (C&I) sector includes commercial, industrial, large scale residential/multi-residential, agricultural, institutional, and governmental.*



Report Outline

- Methodology Overview
- Michigan C&I Solar Market - Demand
 - Growth
 - Impediments
- Michigan C&I Solar Market - Supply & Value Chains
 - Assets
 - Gaps
- Michigan Solar Market - Workforce
 - Assets
 - Gaps
- Michigan C&I Solar Market – Growth
 - Threats of Lagging C&I Solar Adoption
 - Growth Paths
 - Supplier Priorities
- Recommendations to EGLE to Increase C&I Solar Adoption and Accelerate SMM Decarbonization
- Supplements:
 - Michigan Solar Market - Diversity, Equity & Inclusion
 - Michigan Commercial & Industrial DOE Technology Plans



Methodology Overview



Methodology Overview

- Information and data inputs for this report are drawn from four sources:
 - Independent research and project partners
 - Qualitative interviews with 12 solar industry leaders and suppliers (January – February 2022)
 - Online *C&I Solar Adoption Survey* of 24 solar suppliers (May-June 2022)
 - In-person *C&I Solar Energy Convening* of more than 40 C&I solar leaders, suppliers and buyers (June 21, 2022)

- C&I Solar companies that contributed to this report:

Advanced Energy Group	Debora Smith Energy Partners	Lakeshore Die Cast	NSF
Analytical Design Service Corp.	Distributed Power	Lean & Green Michigan	Petrichor Consulting
ApEAL	DTE Energy	Lewenz Solar	PINK Energy
Apex Clean Energy	Ecojiva	LookingBus	Pratt & Associates
APT Solar Solutions	Energy Alliance Group	Mackinaw Power	Ranger Power
Barton Malow	GEM Energy, LLC	McNaughton-McKay	Rettew Field Services
Bedzyk Bros, Inc.	General Motors	Metro Consulting Associates	Schneider Electric
Blueterra Energy	Green Estate Solutions Inc.	Michigan Chapter NECA	Scottsdale Gear&Boiler
Bowman Consulting	Green Portfolio Solutions	Michigan Chemistry Council	SmithGroup
CBS Solar	Harvest Solar	Michigan Conservative Energy Forum	Sumpter Solar Services LLC.
Chart House	Hemlock Semiconductor	Michigan Historic Preservation Network	Sunrun
Christman	Homeland Solar	Michigan Saves	The Green Panel
Clean Energy Buyers Association	Inovateus Solar	Michigan Solar Solutions	University of Michigan
CWP	Invenergy	MTD Consulting Group	Utopian Power



Michigan C&I Solar Market – Demand



Michigan C&I Solar Market – Demand

- Growth
 - C&I demand for solar is modest and growing
 - Why more C&I firms are asking about solar
 - Michigan is well positioned for greater C&I solar demand



C&I Demand for Solar Is Modest And Growing

- C&I demand in Michigan is modest and growing
 - Larger power users are asking about solar projects
 - Solar contractors across the board report growing interest
 - DTE's MiGreenPower has hundreds of signed C&I contracts
 - Several firms specialize in C&I solar in Michigan and other states
 - More residential solar firms are developing C&I offerings
- Yet, overall C&I solar demand is still nascent
 - Market maturity is “where residential solar was a decade ago”
 - Buyers are not well informed, and contractors must provide “a lot of education and hand holding”
 - Solar contractors do “a lot more quoting than installing”
 - Conversations “stalls between the CEO and the accountant”

Source: C&I Solar Supplier Interviews



Why More C&I Firms Are Asking About Solar

- C&I firms want to lower energy costs and uncertainty
 - Michigan electric rates are relatively high and are trending upward – which makes solar more attractive
 - More C&I companies going to time-of-use rates that favor solar offsetting higher day-time rates
- C&I firms want more energy redundancy
 - Michigan's grid unreliability raises concerns about outages – and losing power can be very expensive
 - Solar plus storage offers opportunity for energy redundancy
- Solar is becoming increasingly affordable
 - Solar costs have fallen significantly over last 10 years, and in general continue to fall
 - Note: Solar system installation costs are currently trending higher due to nation-wide solar panel supply constraints and rising labor costs
 - Federal solar tax credit is scheduled to rise from 26% to 30% in 2023, and is now extended for 10 years
- More and more shareholders and customers are asking C&I firms to purchase clean energy
 - Fortune 500 companies are particularly sensitive to this

Source: C&I Solar Supplier Interviews



Michigan is Well Positioned for Greater C&I Solar Demand Growth

- Many C&I firms have electric baseloads that can be offset with solar
 - Commercial solar installations usually range from 500KW to 2 MW
 - Many industrial solar installations can be 2+ MW
- Michigan has thousands of large and well-engineered C&I flat roofs available for solar
 - Large portion of these roofs have 150% load safety factor (1980s code)
- EVs will further accelerate solar adoption as resulting battery installs increase and costs fall
 - Tesla and the Ford F-150 Lightning are changing the battery landscape
 - Many EV charger installations are integrating solar and taking advantage of the solar tax credit
- Michigan has a well established and resilient PV installer ecosystem

Source: C&I Solar Supplier Interviews



Michigan C&I Solar - Demand

- Impediments
 - Michigan C&I firms have limited options
 - Michigan DG caps increase uncertainty
 - Low solar credit rates reduce solar ROI
 - Interconnection studies are excessively burdensome
 - Local permits, tax and siting challenges
 - Other challenges



Michigan C&I Firms Have Limited Solar Options

- Option #1: Purchase solar Renewable Energy Credits (RECs)
 - C&I can purchase RECs on the open market or via virtual PPAs from non-MI RE generators
 - C&I can purchase DTE RECs via DTE's *MiGreenPower* program or Consumer's Business Renewable Energy program
- Option #2: Distributed Generation (DG) - Install "Behind the Meter" (BTM) solar
 - Distributed BTM solar is electricity generated onsite, at the load location
 - C&I firms work with a solar contractor/installer that designs, procures and installs solar systems
 - Solar systems are interconnected with grid and must be approved by utility and local authorities
 - Can be done through the DG program (<150 kW system) or via a Power Purchase Agreement (PPA)
- Michigan C&I firms are not allowed to:
 - Build solar on properties (belonging to them or others) away from load if the power crosses property lines
 - Exception: Some industrial firms can build and access solar located on adjacent properties
 - Buy solar power from independent (non-utility) solar farms located in Michigan
 - Unless they are part of the choice market and are buying from an electric choice market provider

Source: C&I Solar Supplier Interviews



Michigan DG Interconnection Caps Increase Uncertainty

- Michigan's Distributed Generation (DG) interconnection caps curtail C&I demand
 - DG interconnection caps limit non-utility solar inputs to < 1% of average peak load for DTE and < 3% (voluntary) of average peak load for Consumers
 - 50% of cap is allocated for systems < 20 kW (residential and small commercial)
 - 25% of cap is allocated for 20-150 kW (commercial and small industrial)
 - 25% of cap is allocated for anaerobic digester systems
 - DTE and Consumers Energy are free to deny participation in the DG program above these limits
 - Caps are based on nominal capacity of DG systems and average annual peak demand day
 - The low caps make planning for new installations problematic
- Many C&I solar projects could be much more than 150kW – but are often undersized to fit the DG program
- While DTE and Consumers Energy do interconnect solar projects larger than 150 kW, utility-required interconnection/distribution studies and upgrades can be much more expensive and time consuming
- Michigan is one of the only states without net metering that also has a limit on DG installations

Source: C&I Solar Supplier Interviews



Low Distributed Generation Rates Reduce Solar ROI

- Michigan utilities offer C&I firms relatively low rates for DG solar power generated “behind the meter”
 - For “excess” power when a facility’s solar system generates more solar electricity than the current electrical load and exports that excess kW to the grid, Michigan’s utilities pay less than “retail” rates:
 - For solar system sizes of 150 kW or less, C&I customers typically receive 7-8¢/kwh for excess power delivered to grid
 - For solar system sizes of > 150 kW, customers can sign PPAs where generally they only receive payment for the energy provided at the locational marginal price (LMP), typically 2-4¢/kwh
- Michigan’s DG caps are harsh for C&I firms
 - Leading solar states have unlimited net metering with credits at the higher “retail” rates
 - Equivalent to as much as ~ 15-17¢/kwh
 - Many states do not have any DG cap.
- Low DG credit rates cause many Michigan C&I solar projects to have long payback periods and to be undersized
 - Note: DG solar ROI is even more challenging for Municipal governments, which often have difficulty financing projects themselves and do not have tax appetite to take advantage of federal solar tax credits available to private sector entities

Source: C&I Solar Supplier Interviews



Interconnection Studies Are Excessively Burdensome

- All C&I solar projects are grid-tied; utilities must review and approve interconnections to the grid
 - Interconnection studies can be expensive and time consuming and can be delayed by the utility – reportedly even for smaller C&I solar projects
 - DTE is viewed by numerous solar installers and contractors as being “obstructionist”
 - DTE costs and time frames are often unpredictable and seem excessive
 - DTE roadblocks can delay C&I projects 12-18 months, raising costs and risks for all parties
 - Consumers Energy interconnection process is still time consuming and expensive, but broadly viewed as being “more reasonable”
 - Consumers Energy usually conforms to standard costs and time frames
- Excessively expensive and time-consuming interconnection processes raise solar project costs
 - When facing interconnection delays and costs, solar contractors have little recourse except to complain directly to the Michigan Public Service Commission
 - This adds still more costs and frustrations for solar system buyers and suppliers

Source: C&I Solar Supplier Interviews



Local Permit, Tax & Siting Challenges

- Some local townships and municipalities are raising solar project permit fees
- While residential solar systems do not increase property taxes until the property is sold, there are no similar tax incentives for larger C&I projects
 - Tax assessors are often not familiar with and do not know how to assess solar
 - Iowa, Missouri and many other states do not impose property taxes on solar
- Local control of siting can raise project objections, especially for larger C&I solar projects
 - Planning Commissioners are often not familiar with solar, and some can be less than “solar friendly”
 - Local referendums can overturn Board approvals
 - Local challenges have been a recurring impediment to utility-scale solar projects
 - DTE and Consumers Energy have both had to cancel solar projects due to local opposition

Source: C&I Solar Supplier Interviews



Other Challenges

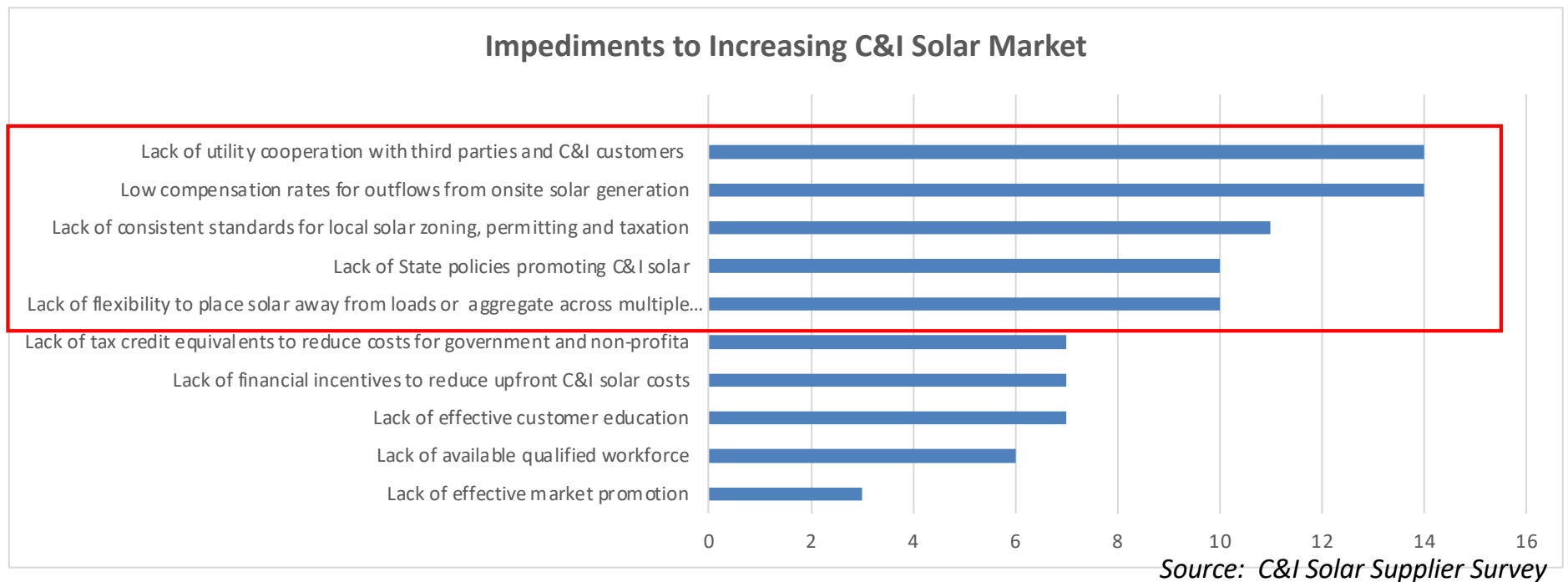
- Michigan does not allow solar “meter aggregation” across property boundaries, limiting solar to the location of the electric load
 - Prevents many C&I firms from optimizing solar system design across multiple properties
- Rising labor rates
 - Increasingly, electrical inspectors are requiring installers to require solar techs to be licensed electricians or journeymen apprentices
 - Davis-Bacon wage requirements to maximize federal tax credits
- Utility moves to apply fixed minimal charges to solar
 - Would increase system fixed costs regardless of performance
- Climate change
 - How will Michigan’s solar profile change over next 25 yrs?

Source: Michigan C&I Solar Supplier Interviews



Impediments to Michigan C&I Solar Market

- According to the C&I Solar Supplier Survey, 3 of 5 top impediments are regulatory. Other two are financial and policy impediments





Michigan C&I Solar Market – Supply & Value Chains

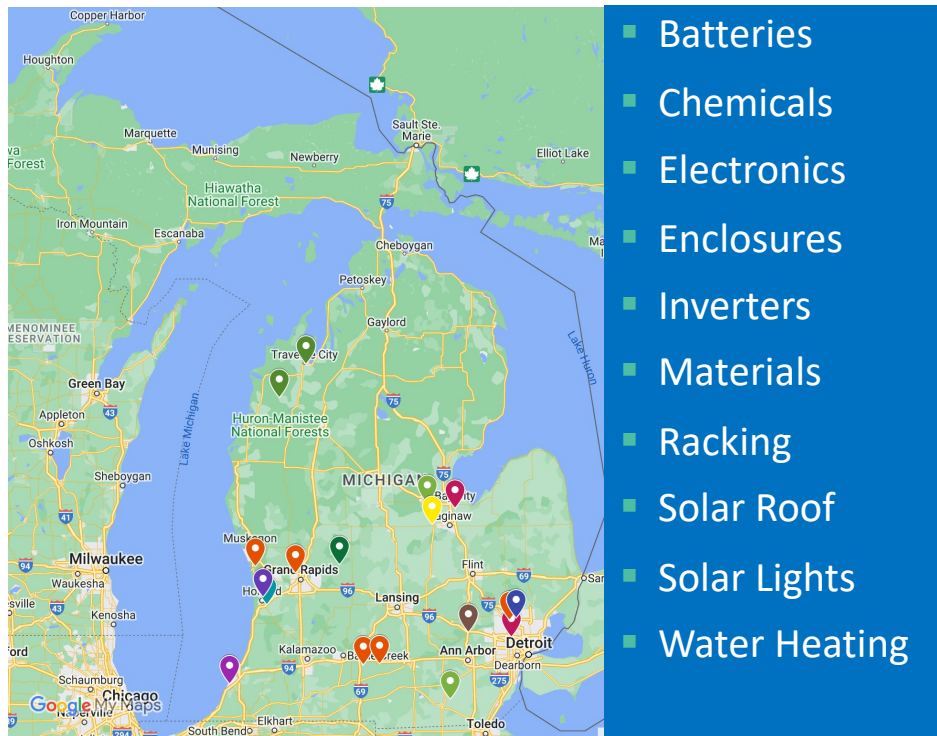


Michigan C&I Solar Market – Supply & Value Chains

- Assets
 - Solar Supply Chain - Manufacturing
 - C&I Solar Value Chain
- Gaps & Suggestions
 - Supply chain & value chain gaps
 - Suggestions to improve Michigan solar supply chain



Michigan Manufacturing Solar Supply Chain



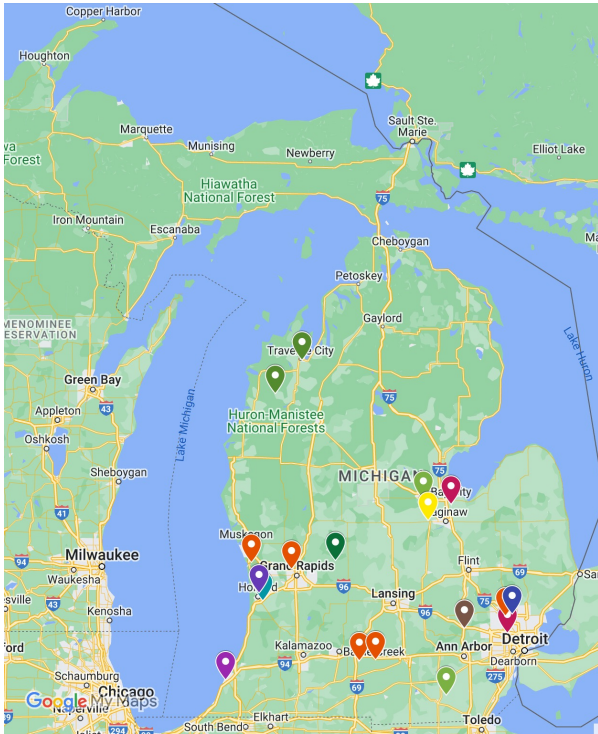
Most Challenging Components to Source

- ✓ Panels
- ✓ Batteries
- ✓ Inverters
- ✓ Electronic components

Source: C&I Solar Supplier Survey



Michigan Manufacturing Solar Supply Chain

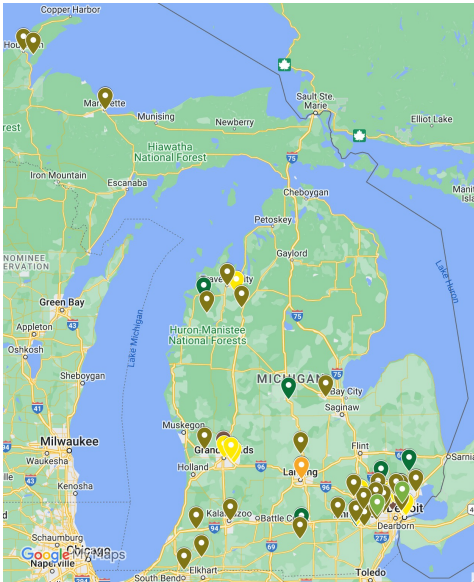


Manufacturers - Solar Materials, Components & Systems

Carport Structures Corp.	Carports & Kits	Oxford
Cone Drive	Trackers	Traverse City
Dow Chemical	Chemicals	Midland
Eaton Corporation	Electronics	Southfield
Fronius USA	Inverters	Brighton
GLE Solar	Water Heating	Benton Harbor
Hemlock Semiconductor Corp.	PV Materials	Hemlock
Lake Shore Die Cast	Aluminum components	Baroda
LG Chem	Batteries	Holland
Luma Solar	Solar Roof	Rochester
Mersen USA	Electronics	Bay City
Robroy Enclosures	Enclosures	Belding
Sinclair Design and Engineering	Racking	Albion
Solar Bos	Racking	Grand Rapids
Solar Mounts LLC	Racking	Marshall
Solar Street Lights USA	Street Lights	Holland
Solar Tilt	Racking	Spring Lake
The Solar RAQ	Racking	Pontiac
Traverse Solar	Trackers	Traverse City
Wacker Chemical Corporation	Chemicals	Adrian



Michigan C&I Solar Value Chain



- Construction
- Distributors
- Engineers & Consultants
- Financiers
- Installers

Installers - C&I Solar

Advanced Energy Group
 A J Leo Electric and Solar
 Aeolus Energy Systems LLC
 Agathon Solar
 Blue Terra Energy
 CBS Solar
 Chart House Energy
 Distributed Power
 Ecojiva
 Four Elements Energy
 G.E.M. Energy
 Harvest Energy Solutions
 Helios Solar
 Heritage Sustainable Energy
 Homeland Solar
 Inovateus Solar LLC
 Invenergy
 Johnson Controls
 Lake Superior Wind and Solar Llc
 Michigan Solar Solutions
 Midland Solar Applicatins

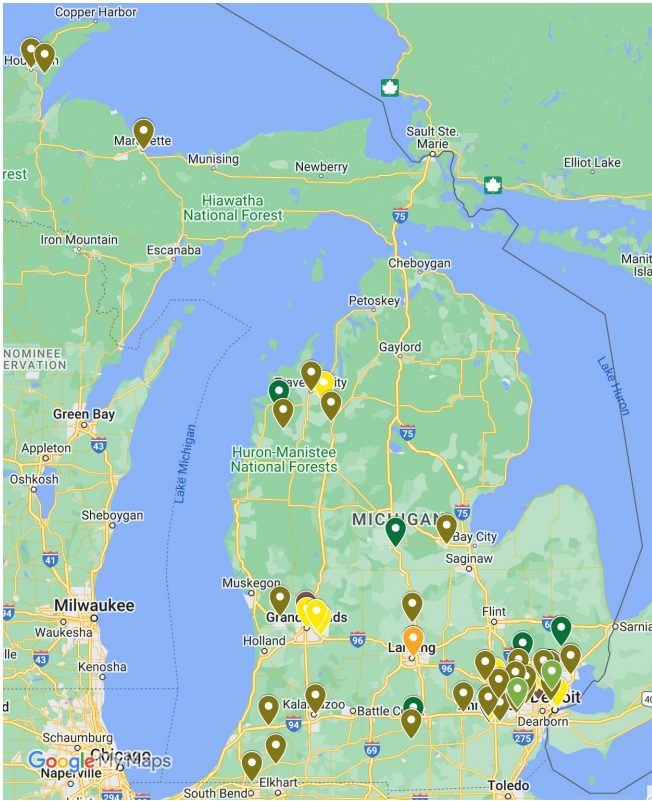
Ann Arbor
 Ypsilanti
 Mount Clemens
 Coopersville
 Hancock
 Copemish
 Muskegon
 Ferndale
 Troy
 Lawrence
 Plymouth
 Jackson
 Kalamazoo
 Traverse City
 Ann Arbor
 Niles
 Breckenridge
 Livonia
 Hancock
 Wixom
 Midland

Modern Mill Solar
 New Energy Solutions, LLC
 Off-Grid Solar
 Peninsula Solar
 PINK Energy
 Power Panel
 Prometheus Power Group
 Quality Solar
 Rustic Resource Renewable Energy
 Ryter Cooperative Industries
 Solar Joint Ventures LLC
 Solar King
 Solar UP
 Solar Winds Power Systems, LLC
 Spark Building Energy Solutions
 Srinergy
 Strawberry Solar
 SUR Energy
 The Green Panel
 Turtle Island Solar
 Utopian Power

Royal Oak
 Milford
 Holland
 Marquette
 Troy
 Oxford
 Ann Arbor
 Saint Johns
 Hanover
 Highland Park
 Troy
 Walled Lake
 Hancock
 Shelbyville
 Livonia
 Novi
 Detroit
 Ann Arbor
 Brighton
 Cassopolis
 South Lyon



Michigan C&I Solar Value Chain



Engineering & Consulting - C&I Solar

Ameresco Solar	Grand Rapids
Ammen Design	Grand Rapids
AMRA Energy	Traverse City
Arbor Consultants P.E.	Grand Rapids
Atwell Group	Southfield
CGE Energy	Brighton
Empower Energies	Troy
Energy Sciences	Berkley
Green Portfolio Solutins	Franklin
Greenlancer Energy	Detroit
Harvest Energy Solutions	Jackson
Invenery	Breckenridge
Johnson Controls	Livonia
Metro Consulting Associates	Plymouth
New Energy Solutions, LLC	Milford
Nova Consultants	Novi
Prometheus Power Group	Ann Arbor
Ricardo Inc.	Belleville
SJW Engineering LLC	North Street
Slifco Electric LLC	Troy
SME	Detroit
SmithGroup	Ann Arbor
Spark Building Energy Solutions	Livonia
Sun Store Energy	Grand Rapids
Theka Engineering	Muskegon

Construction - C&I Solar

Aristeo	Livonia
Barton Malow	Southfield
Christman Company	Lansing
Mid-American Solar	DeWitt

Distributors - C&I Solar

CED Greentech Detroit	Canton
D2 Solar	Detroit
Event Horizon Solar and Wind	Middleville
McNaughton- McKay Electric	Madison Heights

Electrical Contractors - C&I Solar

Butler Electric	Grand Rapids
J. Ranck Electric	Mount Pleasant
J.D. Stratton Electric	Traverse City
Newkirk Electric	Muskegon
Oak Electric Service	Waterford
Rauhorn Electric, Inc.	Romeo
Scholl Electric, LLC	Spring Arbor
Slifco Electric LLC	Troy
Sneider Electric	Ann Arbor
Windemuller	Wayland

Finance - C&I Solar

Comerica - Renewable Energy Grp	Detroit
Farm Bureau Insurance	Lansing
Lean and Green Michigan	Detroit
Michigan Saves	Lansing
Team Financial Group	Walker
The Energy Alliance Group	Ann Arbor
White Pine Renewables	Ferndale



Solar Supplier Supply & Value Chain Gaps

Lack of ...

- Panels *
- Inverters*
- Batteries*
- Shutdown devices, trackers, fuses, wiring *
- Engineering/permitting services
- Field services
- Distributors
- On-time delivery of supplies
- Up-to-date codes

High Costs of ...

- Panels *
- Trucking/shipping *
- Skilled labor *
- Project lead times
- Components
- Government tariffs

* *Mentioned more than once*

Source: Michigan C&I Solar Supplier Survey



Solar Supplier Suggestions For Supply/Value Chain

- State tax/financial incentives for C&I installations *
 - Provide incentives to use MI-made components
- Boost solar demand – improve value prop for solar *
 - Publicize solar stories
- Build in-state manufacturing capacity*
 - Solar Panels and Modules
 - Battery storage
 - Inverters
 - Racking
- Increase number of qualified C&I solar EPC contractors
- Support interconnect certainty for solar companies
- Increase Canadian-Michigan freight options, e.g. Gordie Howe bridge and Detroit-Windsor tunnel

** Mentioned more than once*

Source: Michigan C&I Solar Supplier Survey



Michigan C&I Solar Market – Workforce



Michigan Solar Market - Workforce

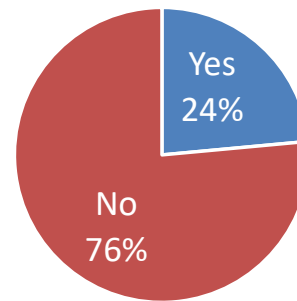
- Supplier Sentiments
- Michigan Schools providing solar workforce training
- IBEW Michigan delivers solar training with apprenticeship & journey-level continuing ed
- Suggestions to improve Michigan's workforce infrastructure

Source: Michigan C&I Solar Supplier Survey

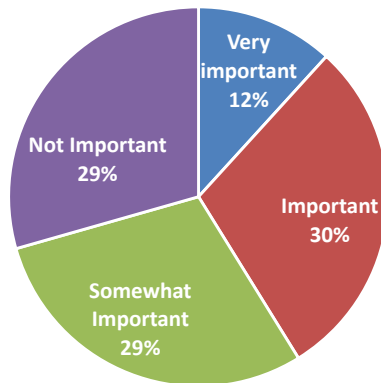


Solar PV Supplier Sentiments

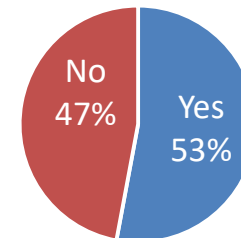
Are you aware of Michigan-based solar education and training resources ? (n=17)



When Hiring, How Important Are Relevant Certificates or Degrees?



Do Michigan workforce education and training gaps or weaknesses hinder your ability to provide more C&I solar solutions?
(C&I Solar Adoption Survey; n=17)





Workforce Infrastructure – MI Schools Providing Solar PV Workforce Training

Delta College

Dorsey College

Ferris State

Grand Rapids CC

Grand Valley State

Henry Ford CC

IBEW Local 58

Jackson CC

Kellogg CC

Lansing CC

Macomb CC

Michigan State Univ.

Michigan Tech Univ.

Monroe CC

Muskegon CC

Northwestern Tech

Oakland CC

Oakland University

Washtenaw CC

Wayne County CC

Wayne State University

Western Michigan Univ.

University of Michigan

= Schools C&I Solar Energy Forum suppliers said they worked with



MI Schools Providing Solar Workforce Training

Delta College www.delta.edu	Green Academics (offer degrees in wind and solar) https://www.delta.edu/sustainability/green-academics.html Solar Photovoltaic Installation Technician Certificate of Achievement https://catalog.deltacollege.edu/preview_program.php?catoid=6&poid=1312	Michigan State Univ www.msu.edu	Richard Lunt , Professor, Chemical Engineering and Materials Science rlunt@egr.msu.edu 517-432-2132
Dorsey College www.dorsey.edu	HVAC Systems Technician training program https://www.dorsey.edu/hvac/	Michigan Technological Univ www.mtu.edu	Ana Dyreson, Assistant Professor, Mechanical Engineering adyreson@mtu.edu 906-487-1173
Grand Rapids Community College www.grcc.edu	Heating, Ventilation, and Air Conditioning/Refrigeration Technology Certificate https://catalog.grcc.edu/preview_degree_planner.php?catoid=18&poid=3275	Monroe County Community College www.monroeccc.edu	Renewable Energy Technology https://www.monroeccc.edu/programs/renewable-energy-technology
Grand Valley State Univ www.gvsu.edu	Heidi Jiao, Professor, Electrical Engineering Jiaoh@gvsu.edu 616-331-6844	Mott Community College www.mcc.edu	Introduction to Renewable Energy Tech. Technology https://catalog.mcc.edu/preview_course_nopop.php?catoid=13&coid=56956
Henry Ford Community College www.hfcc.edu	Energy Technology - HVAC Associate in Applied Science https://catalog.hfcc.edu/programs/energy-technology-hvac-aas (multiple relevant courses, possibly other programs)	Muskegon Community College www.muskegoncc.edu	Wind & Solar Certificate https://www.muskegoncc.edu/degrees-and-certificates/certificate-programs/wind-solar-certificate/
Jackson Community College www.jccmi.edu	Environmental Science – Certificate https://www.jccmi.edu/degree/environmental-science-certificate/	Northwestern Michigan College / Northwestern Technological Institute www.nmc.edu	Renewable Energy Technology - Electrical https://www.nmc.edu/programs/academic-programs/renewable-energy-technology-electrical/index.html
Kellogg Community College www.kellogg.edu	Renewable Energy Certificate http://catalog.kellogg.edu/preview_program.php?catoid=18&poid=1732	Oakland Community College www.oaklandcc.edu	HVAC/R Systems Technology http://catalog.oaklandcc.edu/programs/hvacr-systems-technology/
Kirtland Community College www.kirtland.edu	Facility And Energy Management Degrees https://www.kirtland.edu/programs-we-offer/facility-and-energy-management-degrees/	Oakland Univ www.oakland.edu	Laila Guessous, Professor, Mechanical Engineering Guessous@oakland.edu 248-370-2183
Lansing Community College www.lcc.edu	Study Energy Management at LCC https://www.lcc.edu/academics/areas-of-study/computers-engineering-technology/hvac/study-energy-management.html Heating, Ventilating and Air Conditioning Technology https://www.lcc.edu/academics/areas-of-study/computers-engineering-technology/hvac/index.html	Univ of Michigan, Ann Arbor www.umich.edu	Michael Craig, Assistant Professor, Environment and Sustainability mtcraig@umich.edu 734-764-6708
Macomb Community College www.macomb.edu/	Renewable Energy Technology Certificate https://www.macomb.edu/resources/viewbook/attachments/CT-Renewable-Energy-Technology.pdf	Washtenaw Community College www.wcccd.edu	Heating, Ventilation, Air Conditioning and Refrigeration (APHVCR) https://catalog.wccnet.edu/current/programs/aphvcr.php
MIAT College of Technology www.miat.edu	Energy Technology Programs https://miat.edu/programs/energy/	Wayne County Community College www.wcccd.edu	Renewable Energy Technology program https://www.wcccd.edu/academic/pdfs/programs/Renewable%20Energy.pdf
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IBEW Michigan Delivers Solar Training with Apprenticeship & Journey-level Continuing Ed

- The International Brotherhood of Electrical Workers (IBEW) Michigan has provided electrical journeymen and apprentices with solar-related training for the last 15 years.
 - IBEW Michigan works in partnership with the National Electrical Contractor Association (NECA)
 - IBEW Michigan trains electricians on solar, geothermal, wind, EV, storage and other clean energy topics at 11 training centers across the state
 - Warren, Kalamazoo, Chelsea, Coopersville, Battle Creek, Traverse City, Saginaw, Lansing, Bay City, Flint, Gwinn
 - To prepare for a growing solar industry, IBEW Michigan has provided solar-specific training to more than 1000 journey level electricians and 3800 apprentices over the last decade and a half
- IBEW Michigan is enhancing its solar training curriculum to account for new systems and technologies
 - Curriculum is developed with inputs from electrical contractors, technology partners, educational professionals and IBEW leadership to address customer needs across all market sectors
 - Customized solar training for Journey-level workers is planned in 2023 to ensure electrician workforce readiness within the IBEW workforce
 - Solar Companies/General Contractors partner with union electrical contractors to source IBEW trained electricians for solar work across market sectors. (Residential, Commercial, Industrial)
 - NECA has an extensive electrical contractor network in Michigan utilizing IBEW trained electricians

Source: MTD Consulting Group



Supplier Workforce/Educational Gaps That Hinder C&I Solar Success

- Lack of knowledge about ...
 - What education programs exists
 - Funding options
 - How to Close the Deal - Steps & Process
 - Solar by general public and C&I
 - “Mind-warping hodge-podge” of local permit rules, regs & fees
 - Fast changing, dynamic technologies, and a myriad of options
- Lack of training
 - Basic training on C&I designs/installations
 - Medium to high voltage electrical systems
 - Solar servicing
 - System commissioning
- Lack of talent
 - Experienced construction and electrical workers to support large - scale solar
 - Trained Electricians
 - Educated installers
- Other Gaps
 - On-site training
 - Outdated building codes for residential and C&I
 - Lack of communication and interactions between solar contractors and IBEW Michigan
 - Challenging State compliance regulations for handling PV (needing a Class II electrician)

Source: Michigan C&I Solar Supplier Survey



Suggestions to Improve Michigan C&I Solar Workforce Infrastructure Include*

Provide cutting edge training & retraining to electricians and technicians:
<ul style="list-style-type: none">• Consistent and balanced development program for C&I and utility-scale (i.e. larger) solar• C&I design/installations and medium-to-large voltage electrical solar systems• Solar system commissioning and servicing
Update, simplify & improve policies and regulations for:
<ul style="list-style-type: none">• Solar installations and grid interconnections• State compliance regulations for handling PV (Class II electricians)• Building codes outdated for residential and for C&I solar• Clarify “solar installer” definitions• Avoid mandates that only “electricians can carry solar modules”• Local permit rules, regs & fees”
Adopt North American Board of Certified Energy Practitioners (NABCEP) Certifications
Provide job training funds

Source: Michigan C&I Solar Supplier Survey



Higher Michigan C&I Solar Sales → More Hires

Number of New Hires If Your Firm's C&I Solar Sales Double*

No new jobs	-
1-10 new jobs	30%
11-25 new jobs	23%
26-50 new jobs	23%
50+ new jobs	23%

* C&I Solar Adoption Survey; n=13

Number of New Hires If Your Firm's C&I Solar Sales Are 10 Times Greater Than Current Sales*

No new jobs	-
1-10 new jobs	14%
11-25 new jobs	7%
26-50 new jobs	7%
50-99 new jobs	42%
100+ new jobs	28%

* C&I Solar Energy Convening; n=14

More C&I Solar → More Hires

With more than 40 C&I installers alone in Michigan:

*Doubling C&I solar in Michigan will add hundreds of new hires.
Growing C&I solar demand by 10x will add thousands of new hires.*



Michigan C&I Solar Market – Growth



Michigan C&I Solar Market – Growth

- Threats of Lagging C&I Solar Adoption
 - Intensifying stress on Michigan’s electrical grid
 - Higher electric rates
 - Missed decarbonization goals
 - Weakening of Michigan’s C&I solar ecosystem



Intensifying Stress On Michigan's Electrical Grid

- Michigan's grid stress will intensify as broad electrification increases across all sectors
 - Michigan's grid works best when local loads are low
 - Michigan's grid stress will become intensify as:
 - Demand for air conditioning grows due to warmer summers
 - Michigan electric vehicle sales grow
 - Adoption of commercial and industrial decarbonization technologies increase
- More C&I solar will reduce local electrical loads, and thus local grid stress and costs
 - Solar flattens peak loads during day, especially in summer
 - Solar + batteries combined enhance grid stability & reliability
- Further upgrades to the grid will be costly – and can be reduced with more C&I solar projects
 - Recent studies describing the grid benefits of distributed solar include:
 - https://www.synapse-energy.com/sites/default/files/Solar_Savings_in_New_England_20-082.pdf
 - <https://www.utilitydive.com/news/efficiency-ders-saving-26b-in-avoided-transmission-costs-caiso-says/519935/>
 - <https://www.localsolarforall.org/roadmap>

Source: Michigan C&I Solar Supplier Interviews



Higher Electrical Rates • Harder to Achieve Michigan Decarbonization Goals • Weakening Solar Ecosystem

- Higher electrical rates
 - Michigan's grid is already relatively expensive and unreliable
 - Michigan's electric power costs are rising
 - Michigan's rate of power outages is high relative to other states
 - Rising electric rates reduce C&I competitiveness compared to C&I in lower energy cost states
- Harder to achieve Michigan decarbonization goals
 - C&I represents about 2/3rds of Michigan's electrical consumption
 - A number of Michigan utilities are continuing to prioritize fossil fuel solutions
 - Utility IRPs limit the renewable energy they expect to acquire through their own projects or PPAs
 - Reasons: siting, zoning, time lags in MISO interconnection
 - Utilities expect natural gas to meet anticipated grid demand-capacity gaps in their IRPs
 - Utility IRP models do not currently account for significant distributed generation
 - Large scale C&I solar is key to achieving carbon reduction/ elimination goals of the state and its communities
 - Also, projected grid gaps can be offset in part as C&I solar is scaled
- Michigan's C&I solar ecosystem weakens as firms and talent focus on other more solar-friendly states
 - Illinois has favorable solar policies and its solar market is taking off
 - Virginia, New Mexico, Georgia, among others, are also improving their markets for solar

Source: Michigan C&I Solar Supplier Interviews



Michigan C&I Solar Market – Growth

- Growth Paths

- Accelerate electrification with DG
- Align utility & solar developer interests
- Make policies and processes more solar-friendly
- Improve financing & business models



Accelerate Electrification w/ DG

- Do long term planning & model electrification over 30-50 yrs.
 - Especially critical with rise of EVs and batteries
 - Develop cost and reliability scenarios with smaller and larger amounts of distributed solar generation with and without battery storage
- Calculate and apply a “True Value of Solar”
 - States that have done this find solar value can exceed retail rates
 - If solar generators received close to retail rates, C&I solar takes off

Source: Michigan C&I Solar Supplier Interviews



Align Utility & Solar Developer Interests

- Promote and celebrate Michigan C&I solar success stories as win-wins
- State government/EGLE work with MPSC, utilities, C&I buyers and renewable energy developers to craft a joint vision of an electrified Michigan
 - Develop integrated business models that support success of utilities, solar suppliers, and C&I buyers
 - Ask for utility collaboration and cooperation; demand accountability
 - Aggressively encourage and enable distributed C&I solar

Source: Michigan C&I Solar Supplier Interviews



Make Policies & Processes Friendly for C&I Solar

- Eliminate Michigan's overall DG program cap
- Return to net metering or a value of solar credit
- Enable meter aggregation
- Simplify, standardize & streamline interconnection studies/needs
- Consider creating state-wide or model PV taxation, permitting and siting standards for Michigan's communities

Source: Michigan C&I Solar Supplier Interviews



Improve Financing & Supplier Business Models

- Help suppliers take full advantage of recent Federal legislation
 - IRA, CHIPS Act, IIJA
- Expand Michigan Saves to provide better terms and reduce risk for larger C&I projects
- Add state tax credits
- Add grants/loans to offset interconnection costs
- Facilitate C&I pooling/aggregation of solar purchasing
 - Including virtual PPAs for non-utility solar generated in Michigan
- Provide incentives grants/loans to targeted C&I groups (e.g. retail stores) to raise awareness and spark action

Source: Michigan C&I Solar Supplier Interviews



Michigan C&I Solar Market – Growth

- Supplier Priorities to Boost C&I Solar
 - Single biggest supplier needs today for more C&I solar success
 - Most urgent suggestions to boost Michigan C&I solar market (C&I Supplier Survey)
 - Most important policy changes for Michigan C&I solar growth (C&I Solar Energy Forum)



Your Solar Firm's Biggest Need Today for More C&I Solar Success?

C&I Solar Adoption Survey (n=21)

<u>More ...</u>	<u>Rank</u>
▪ Customers	1
▪ Qualified employees	2
▪ Partners	3
▪ Marketing	4
▪ Energy Industry Connections	4
▪ Capital	6

-

C&I Solar Energy Convening (n=25)

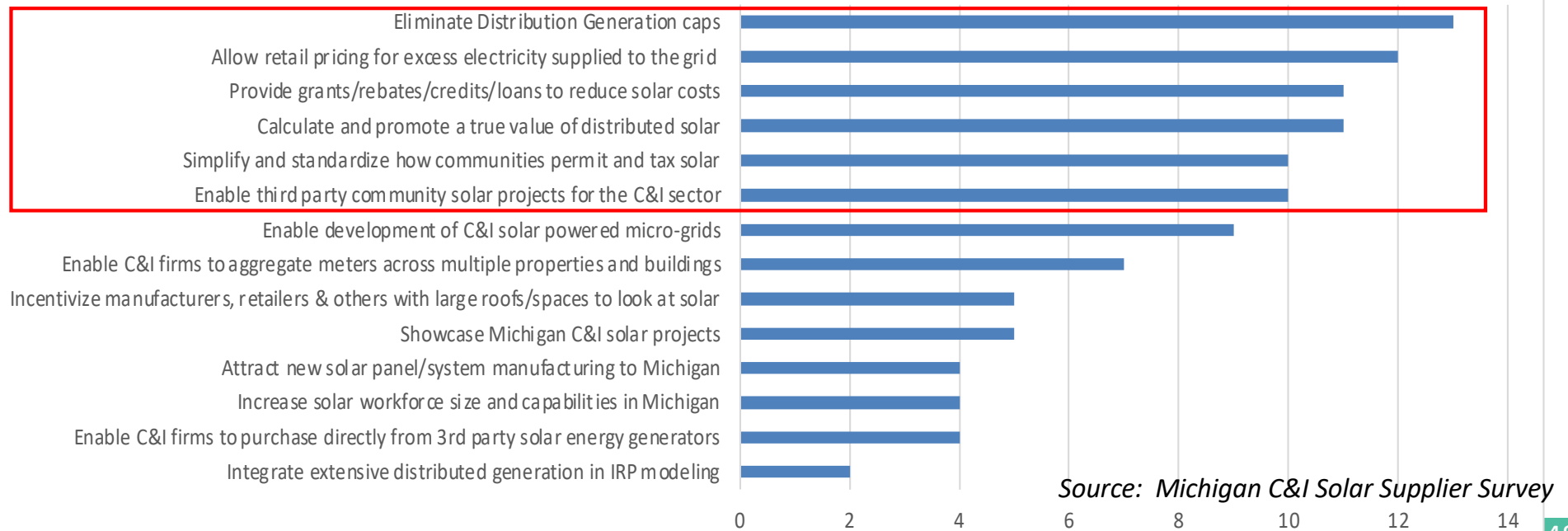
<u>Better/More ...</u>	<u>%</u>
▪ Better Policy	40%
▪ Qualified employees	28%
▪ Customers	20%
▪ Suppliers	8%
▪ Energy Industry Connections	4%
▪ Partners	-
▪ Capital	-



Most Urgent Suggestions to Boost C&I Solar Market

- According to the C&I Solar Supplier Survey, of the 6 top suggestions chosen, 3 are regulatory and 3 are financial.

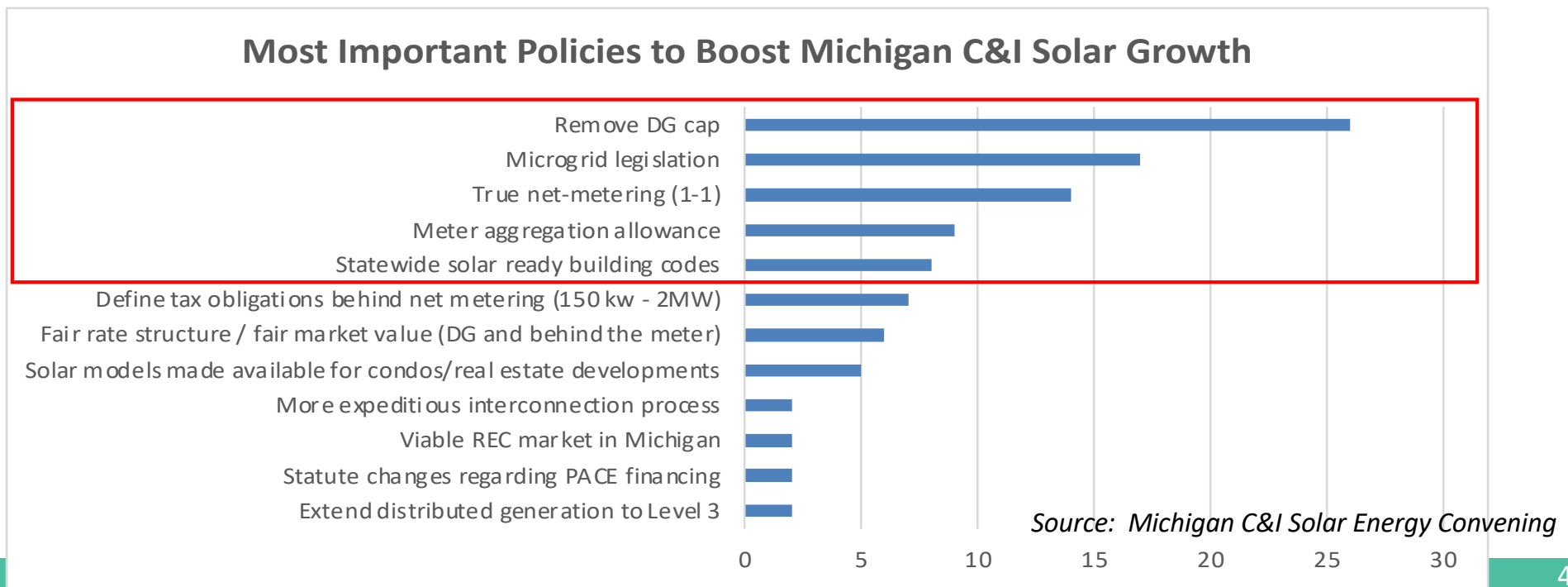
Suggestions to State to Boost C&I Solar Market





Most Important Policies for Michigan C&I Solar Market Growth (Source: C&I Solar Energy Forum)

- According to solar suppliers at the C&I Solar Energy Convening, the top 5 policies to grow the C&I solar market in Michigan can all be enacted by Michigan's legislature.





Top C&I Solar Supplier Priorities

- Regulatory Relief *
 - Eliminate DG caps
 - Enable development of C&I solar powered micro-grids
 - Enable C&I firms to purchase directly from 3rd party solar generators and community solar projects
 - Simplify and standardize how communities permit and tax solar
 - Establish statewide solar ready building codes
- Financial Assistance *
 - Calculate and promote a *true value* of distributed solar
 - Allow retail pricing for excess electricity supplied to the grid
 - Provide grants/rebates/credits/loans to reduce solar costs
 - Incentivize manufacturers, retailers, real estate developers & others to look at solar
 - Statute changes regarding PACE financing

** Suggestions in these categories are rank ordered “high to low” based on C&I solar supplier survey and convening inputs.*



Other C&I Solar Supplier Suggestions

- Boost Supply Chain
 - Attract new solar panel/system manufacturing to Michigan
 - Increase numbers of qualified solar EPC contractors
 - Increase Canadian-Michigan freight options
- Boost Workforce
 - Develop and provide cutting edge training/retraining programs for C&I
 - Update, simplify and improve workforce policies and regulations for solar installations & interconnections
 - Adopt national training certifications
 - Provide job training funds
 - Update building codes
- Help utilities become much more DG-friendly
 - Integrate extensive distributed generation in IRP modeling
 - Establish clearer, fairer and more expeditious interconnection standards and processes
- Publicize C&I Solar
 - Showcase Michigan C&I solar projects
 - Publicize C&I solar stories



Recommendations to EGLE to Increase C&I Solar Adoption and Accelerate SMM Decarbonization



Recommendations for EGLE to Increase C&I Solar Adoption

- Share, Convene, & Advocate
 - Share solar market policy, regulatory, and utility-DG “best practices” in leading solar states
 - Study C&I solar-acceleration best practices and business, finance, and utility models in other states/globally
 - For example, look at potential of integrating feed-in tariffs with model “small/DG project” zoning
 - Look at innovative models that encourage utilities to transition more quickly to a “DG abundant” future
 - Examine practices that are particularly good at serving underserved, distressed, and rural communities
 - Share leading C&I solar workforce development programs and best-practices
 - Share with faculty, administrators and program developers at Michigan schools
 - Convene workforce/supplier events to increase connections, information sharing and talent flows
 - Convene regular series of decarbonization events that pull together C&I buyers and solar suppliers to educate, connect, and facilitate C&I solar, geothermal, and wind adoption
 - Partner with GLREA, Michigan EIBC, MGEA, Michigan Manufacturers Association, USGBC and other key groups
 - Educate C&I building owners and managers about renewable energy solutions, suppliers, and funding
 - Seek supplier feedback and guidance for EGLE about future C&I solar priorities, funding, and programs
 - Highlight C&I solar success stories in Michigan
 - Advocate for Michigan utilities, the Michigan Public Service Commission, and the Michigan legislature to better appreciate the significant potential for Michigan C&I Solar to create hundreds and even thousands of new jobs and to meet Michigan decarbonization goals.



Recommendations for EGLE to Increase C&I Solar Adoption

- Ease Financing
 - Review/share solar market financing “best practices” in leading solar states
 - Facilitate and expand funding options for C&I firms to purchase solar solutions
 - Help industry take full advantage of future funding and benefits from IIJA, IRA, & CHIPS
 - Increase financial incentives for projects utilizing Michigan content and suppliers
 - Increase financial incentives for projects in underserved/distressed/rural communities
- Integrate C&I solar into the MI Healthy Climate Plan and relevant state office directives
 - Model and roadmap C&I solar market installations needed to contribute substantially to aggressive Michigan carbon reduction goals
 - Incorporate growing supply chain requirements and additional workforce needs
 - Convene additional solar industry surveys and forums to update solar industry acceleration recommendations, especially given recent passage of the IRA
 - Assess opportunities to ramp up new solar manufacturing in Michigan, especially panels and inverters
- Support Solar Innovation
 - Support technology R&D by Michigan companies and universities for next generation solar, energy storage, and building integrated PV (BIPV)



Additional Recommendations for EGLE to Accelerate SMM Decarbonization

Michigan small and medium-sized manufacturers (SMMs) have **tremendous potential** to reduce energy consumption and greenhouse gas emissions in their facilities and processes.

- Decarbonizing strategies include:
 - Consume more solar, wind, geothermal and other cleaner renewable energy sources
 - Electrify equipment and processes that currently use natural gas or propane
 - Fuel switch to replace natural gas fuels and propane with carbon neutral biogas or zero-carbon hydrogen
 - Adopt more energy efficient equipment and processes
 - Adopt Industry 4.0 technologies which improve process performance, reduce resource wastage, or better manage idle equipment, for example



Additional Recommendations for EGLE to Accelerate SMM Decarbonization

Leaders of small and medium-sized manufacturers (SMM) in Michigan have a growing interest in different decarbonizing strategies, but Michigan SMMs **face significant decarbonization challenges**.

- Decarbonizing challenges for SMMs including:
 - Lack of internal knowledge, capacity, or skills to navigate the:
 - Range of decarbonization options available and developing a sound decarbonization roadmap
 - Potential resources available to them
 - Decarbonization implementation process
 - Relevant regulatory environment
 - Lack of internal relevant expertise to identify, evaluate, or pursue decarbonization strategies, and the extra “bandwidth” and knowledgeable work force onsite to implement attractive decarbonization strategies
 - Lack financial strength and lower risk tolerance given overall market uncertainties and current economic pressures such as high inflation, rising interest rates, and workforce recruitment challenges

SMMs need independent and objective programs that help them 1) achieve their carbon reduction goals, 2) navigate contractors, incentives and regulations, and 3) not weaken their financial position.



Additional Recommendations for EGLE to Accelerate SMM Decarbonization

Based on years of experience and many interviews with SMM leaders, Centrepolis offers EGLE a range of integrated and self-reinforcing **recommendations to accelerate SMM decarbonization**.

- Recommendations to accelerate SMM decarbonization can be organized into four themes:
 1. Educate
 2. Demonstrate
 3. Help SMMs implement
 4. Take additional steps



Additional Recommendations for EGLE to Accelerate SMM Decarbonization

Theme #1: **EDUCATE** Michigan SMMs about clean energy technologies, energy efficiency, and other decarbonization strategies, and guide SMMs through onsite clean energy technology adoption. Education steps include:

- Hold multiple SMM decarbonization events throughout Michigan to educate C&I building owners and SMMs on decarbonization options, strategies, resources and success stories. Include:
 - Educate SMMs on available clean energy / energy efficiency assessments and implementation programs
 - Present and work with SMMs to develop decarbonization “recipes,” roadmaps and resources tailored to accelerate decarbonization for different C&I market segments
 - Present case studies of SMM decarbonization success stories
- Work with relevant trade and professional associations to establish industry-specific decarbonization standards and decarbonization roadmaps that align the MI Clean Climate Plan and DOE goals



Additional Recommendations for EGLE to Accelerate SMM Decarbonization

Theme #2: **DEMONSTRATE** that SMM decarbonization is doable in Michigan, and that ELGE wants demonstration to happen in Michigan. Demonstration steps include:

- Aggressively showcase and appreciate Michigan C&I decarbonization success stories
 - Set up industry-specific decarbonization competitions (e.g. DOE's "Battle of the Buildings")
- Augment, accelerate and expanded decarbonization innovation RD&D programs to more fully leverage federal resources, Michigan's universities, and Michigan's many decarbonization solution providers
- Encourage SMMs to pilot test and help evaluate new technologies
 - Many new clean energy / energy efficiency technologies are proven, but not yet widely adopted
 - At the same time, many SMMs are willing to pilot and test out newer technologies.
 - Develop a decarbonization pilot and demonstration program that intentionally encourages Michigan SMMs to help evaluate promising, new and next generation clean energy / energy efficiency solutions



Additional Recommendations for EGLE to Accelerate SMM Decarbonization

Theme #3: **HELP SMMs IMPLEMENT.** It is critical that clean energy / energy efficiency project implementation support be part of resource support for SMMs. As stated previously, Michigan SMMs do not have capacity or expertise to begin or implement onsite clean energy transitions.. SMMs need both external expertise as well as grants to help offset the cost of clean energy / energy efficiency implementations.

In addition, it is important to equitably distribute implementation resources and other additional support to less-resourced companies. Special consideration for implementation support should be given to Michigan SMMs that are located in:

- Historically disadvantaged, distressed or underserved communities
- Rural communities, and
- Communities where fossil fuel power generation systems are closed or have planned retirements and additional assistance is needed to decarbonize from a legacy of GHG impacts.



Additional Recommendations for EGLE to Accelerate SMM Decarbonization

- We recommend EGLE consider supporting a range of State Energy programs to help Michigan SMMS accelerate decarbonization implementation. The aim would be to help SMMs to:
 - Quickly and holistically assess their opportunities to reduce energy usage, fuel switch to cleaner energy sources, and integrate decarbonization principles into product development
 - Identify, evaluate and adopt additional onsite clean energy and energy efficiency solutions
 - Expedite access to financing tools that reduce ROI
- Implementation support program options include:
 - Energy audits to improve manufacturing process energy efficiency and lower GHG emissions
 - Industry 4.0 technology opportunity audits and road mapping
 - Assessments of fuel switching to electric production processes
 - Provide expedited access to financial analysis tools and financing options
 - Offer specific funding for SMMs to electrify processes for facilities and production lines



Additional Recommendations for EGLE to Accelerate SMM Decarbonization

Theme #4: **TAKE ADDITIONAL STEPS.** Significant decarbonization will not be easy or quick for many SMMs. There are important additional steps, however, that will positively impact Michigan's journey, including:

- Accelerate workforce development to support SMM decarbonization.
 - The Inflation Reduction Act incentives will spur demand for a much larger pool of skilled labor that Michigan currently has for clean energy/energy efficiency assessments and SMMs future decarbonization implementation projects.
 - There will be a need to certify hundreds of new clean energy / energy efficiency assessment and implementation professionals. A program option includes:
 - Internship programs that pair experienced engineers with clean energy / energy efficiency expertise with students to educate the future workforce. These students could be paired with experienced engineers and assigned to work directly with Michigan SMM's to carry out implementation projects in their production facilities. The intent is to prepare these students for careers in clean energy on both the supply and demand side of the industrial sector.



Additional Recommendations for EGLE to Accelerate SMM Decarbonization

- Promote Michigan content.
 - Incentivize Michigan SMMs to have more Michigan content in products and service providers.
 - For competitive bid projects to the State, ensure higher value scoring criteria for those clean energy / energy efficiency projects that can demonstrate more Michigan content.
 - For projects where grant or incentives are offered directly to the SMMs, provide a higher project value or higher tax incentive for clean energy / energy efficiency projects that can demonstrate more Michigan content.
- Promote more SMM decarbonization in disadvantage communities.
 - For competitive bid projects to the State, place a higher value scoring criteria for SMM decarbonization projects located in disadvantaged communities.
 - For projects where grant or incentives are offered directly to SMMs, provide a higher project value or higher tax incentive for decarbonization projects that located in disadvantaged communities.
- Promote integration of energy storage and electrification
 - Incentivize integration of energy storage for decarbonization projects, such as those with solar, wind and EVs.
- Promote Michigan SMM decarbonization innovation
 - Augment, accelerate and expand decarbonization innovation RD&D programs to more fully leverage federal resources, Michigan's universities, and Michigan's many decarbonization solution providers



Supplement: Michigan Solar Market – Diversity, Equity, & Inclusion



Michigan Solar Market – Diversity, Equity & Inclusion

- Methodology
- Findings: Interviews with minority-owned commercial firms
- Findings: Interviews with community leaders
- Summary & suggested solutions



Methodology – Conducted Qualitative Interviews

- Interviewed two (2) individuals who own/manage commercial solar energy companies
 - Ryter Cooperative Industries (Black owned)
 - D2 Solar (Woman owned)
- Interviewed fourteen (12) individuals who own/manage commercial clean energy/environmental companies
 - Walker Miller Energy Services (Black, woman owned)
 - Superior Innovative Solutions (Black, woman owned)
 - NexTiles (Black, woman owned)
 - Dunamis Clean Energy Partners (Black, woman owned)
 - Meknology (Black owned)
 - Mackinac Technology Company (LGBT owned)
 - Clean Energy Partners (Woman owned)
- Interviewed Four (4) leaders of organizations providing solar solutions to underserved Detroit-area communities
 - Treehouse Project
 - Eastside Community Network
 - North End Woodward Community Coalition
 - We Want Green, Too



Michigan C&I Solar Market – Diversity, Equity & Inclusion

- There are few minority owned companies in Michigan’s C&I solar energy space
 - Four C&I solar companies identified are: D2 Solar, Ryter Cooperative Industries, Ecojiva, and Srinergy
- Findings from interviews with owners/managers of minority-owned commercial firms
 - The main obstacle for minority owned business is their small size
 - Race is perceived to play a role in the inability to secure contracts
 - Unique challenges of LGBTQ and veteran owned businesses
 - Minority certification is generally helpful, with caveats
 - Receiving expert guidance is crucial to success
 - Strong desire: an organized renewable energy vendor community
 - EGLE/State of Michigan can engage and support minority businesses in multiple ways



Main Obstacle for Minority Owned Business is Their Small Size

- Most of the companies we spoke with were very small businesses (< 10 employees)
- All felt their small size was the top hurdle in securing more business, whether from private companies or government
- All interviewed perceived they were passed over for projects they could have completed
 - All perceived the cause stemmed mainly from their small company size
 - “Companies want to minimize risk; that often means working with bigger companies...Even I do this with my own vendors.”
- This challenge for smaller businesses in general is compounded by their minority status (see next slide)
 - *“It’s not so much of question of being a minority...You should ask the people at the table, ‘Do you take (small) companies like [our company] seriously?’”*
 - *“There is no on-ramp...I’ve never felt welcome in the energy space until recently. We often find about things too late, or we have to push our way in”*



Race is Perceived to Play a Role in the Difficulty to Secure Contracts

- While small company size is considered the top obstacle by minority owned-businesses interviewed, racial bias is also felt
 - There was a feeling that “extra work” needed to be done to prove qualification
 - Additional time is needed to build rapport with potential customers
- Many potential customers minority-owned companies work with are owned/operated by non-minorities
 - Minority firms are “starting from behind” compared to others with more common majority ethnic backgrounds
 - “We were the only minority in the room” was a common statement
 - “In areas like construction, it is white male dominated and they felt some discomfort working with a minority owned business”
- Lack of familiarity & uninformed preconceived notions, rather than overt racism, were viewed by minority-owned firms spoken with as the main barriers in securing contracts
 - *“Always, I have to prove myself because I’m a woman. I just did \$1M job and it’s not good enough. It’s assumed I don’t have the ability/work capacity. There are very few woman in the energy space.”*
 - *“There are subtle biases- the way I dress, what I eat. That also impacts their perception.”*



Unique Challenges of LGBTQ & Veteran Owned Businesses

- LGBTQ Challenges include:
 - Not everyone is comfortable certifying as a LGBTQ business.
 - Tradeoffs includes working with vendors that may not be comfortable with LGBTQ businesses
 - There can be a fear of “retaliation” and/or violence
 - *“Putting LGBTQ status on the website...if they see the certification, they might be afraid to work with us, especially with manufacturing.”*
 - LGBTQ Certification is relatively new, and some LGBTQ-owned companies may well take a wait-and-see approach to certification
- Challenges for veteran-owned companies include:
 - Many veterans face issues related to PTSD
 - It’s important to be aware of PTSD and its potential consequences
 - Additional challenges may confront female veterans who may have been victims of sexual harassment in the military



Minority Certification Is Generally Helpful, With Caveats

- Generally, official certification of minority status was seen by those interviewed as a positive
 - Certification opens up opportunities for grants, and customers looking for diverse partners
- However, the time and money needed for certification was a barrier for some people
 - *“I did the federal certification. That was easy. I see the value of [certifying with the Michigan Minority Supplier Development Council], but I’m limited by time/resources.”*
- There was also reluctance around formal certification process and assuming that label
 - *“I feel this “label” is a double-edged sword. I want to be known for our reputation and the projects we do.”*
 - LGBTQ firms that certify as LGBTQ essentially have to be willing to “publicly come out of the closet”
- Some interviewed stated they do not fully comprehend the benefits of certifying
 - This lack of knowledge about certification may prevent companies who could benefit from doing so



Receiving Expert Guidance Is Crucial to Success

- Two types of expertise were frequently mentioned: purchasing & product development
- Wanted: expertise to help navigate the purchasing process
 - There was a repeated feeling that while securing meetings is easier now than in the past, winning the purchase order remains the challenge
 - *“We need help in guiding us to more movement...how do we get the PO? The intentions [to meet with us] are great, but the result is not there.”*
 - Similarly, those interviewed repeated asked for guidance to win RFPs or grants from the State of Michigan
 - *“What are the State’s requirements and expectations?”*
- Wanted: product development expertise
 - The early-stage businesses interviewed in particular want feedback to optimize their products
 - *“We want to create a product people want. It would be great if EGLE could facilitate introductions.”*



Strong Desire: An Organized Renewable Energy Vendor Community

- Minority business owners interviewed expressed feeling of being disconnected/isolated
 - Especially as a minority especially in the energy space, in contrast to the automotive sector
- There were companies interviewed that knew of one another, but others were not as well connected
- Those interviewed perceived minority organizations like MMSDC as useful, but too broad
 - There was a repeated desire for a minority ownership group focused on renewability/sustainability
 - Even well-established minority business owners do not feel they know of other minority businesses in this sector
- Several interviewed expressed interest in leadership and organizing
 - Two women-owned companies have created a “Women in Energy” group
 - *“There is a lack of support. I feel isolated being a woman CEO, especially compared to men. It’s a lonely job.”*
 - Creating new organizations like this are hard to do on one’s own. Additional support would be helpful.



How can EGLE/State of Michigan Can Engage Minority Businesses? Several Suggestions

- Suggestions on how EGLE/State of Michigan can improve business opportunities for minority owned companies included:
 - Put minority businesses on a listserv operated by EGLE to inform them of opportunities in the state (both commercial and governmental)
 - Hold regularly scheduled webinars about upcoming opportunities (commercial or government) specifically for minority-owned businesses
 - Provide better information and details on how to secure future state contracts and grant(s)
 - E.g. What is the state of Michigan looking for in an awardee?
 - Support the creation of a DEI business accelerator focused on energy
 - Several interviewed had participated in startup accelerator programs such as the Goldman Sachs 10K Small Businesses and the Apple Impact Accelerator (DEI specific)
 - The mentorship from experts that understood the needs of small businesses was a strength of these programs
 - Facilitate access to actual customers to provided feedback on what customers are looking for in a supplier



Supplement: Michigan C&I Solar Market – Diversity, Equity & Inclusion

- Findings: Interviews with leaders of community groups
 - Community groups are doing important solar energy work
 - Community involvement is key to promoting renewable energy
 - Perception of EGLE by local citizens is problematic and has real challenges



Community Leaders Are Doing Important Solar Work

- North End Woodward Community Coalition
 - Goal: 1000 households of low-income families equipped with rooftop solar solutions by 2024
 - Actual: 10 household systems installed to date
 - Working with minority solar installers including Ryter Cooperative Industries and Srinergy
- Community Treehouse Center Detroit
 - Installed solar on 25 roofs in Detroit
- We Want Green, Too
 - Provides training to veterans to install solar
- Eastside Community Network
 - Runs a Climate Equity Policy Advocacy Program that includes community solar
- Two community organizations also manage non-solar sustainability efforts to improve the community:
 - North End Woodward Community Coalition is installing neighborhood Wi-Fi
 - Eastside Community Network advocates for business and economic development, climate equity, community organizing and planning, and youth development.



Community Involvement Is Key To Promoting Renewable Energy

- Many companies and organizations are working at the neighborhood and city level, not state
 - “There’s a need to bridge the gap between this level and the state level”
- A frequent sentiment: Renewable energy work must be guided by a commitment to racial equity, environmental justice, and mindful of the legacy of “white environmentalism”
- Word of mouth plays a big role
 - Either the information is in that community, or it isn’t
 - Trust comes from community leaders
- If community well-being is important, providing jobs/job training needs to be emphasized
 - *“Unless we do more to diversity and increase the number of people engaged through some type of economic incentive for both training and taking on the work . . . Its going to be very difficult for us to achieve our green infrastructure goals, even if we can all conceptually agree on it.”*
 - *“We train people in our local communities because they stay and get the work done.”*



Perception of EGLE By Local Citizens Is Problematic And Has Real Challenges

- EGLE's reputation, especially in Detroit, is problematic
 - *"EGLE has been asleep at the wheel."*
 - *"EGLE has neglected the environmental needs of our community. It is at best neutered, at worst seen as in collusion with the industrial forces"*
 - *"EGLE has played a passive role" around environmental justice role; the state has been lax and permissive"*
 - *"EGLE enforces EPA standards but is not necessarily creating standards of justice that are responsive to community needs."*
 - *"EPA sets minimal standards, but are those the only standards we should live with?"*
 - *"EGLE approves most air permits, and denies very few. There's no justice component that we can see."*
 - People complain about air quality decisions around black communities in Flint and Detroit
- The legislature is "letting industry run amok"
 - *"EGLE can go to the legislature and advocate. Currently it doesn't seem like EGLE is taking that advocacy role. Labor force needs, small business incentives, make sure these are done in a socially and racially just way."*



Michigan C&I Solar Market – Diversity, Equity & Inclusion

- Suggested Solutions
 - The main issues
 - Solutions suggested by interviewees
 - Ways EGLE can work with minority owners to advance solar



The Main Issues

- Most minority owned solar companies are very small – and do not compete well for larger projects
 - Small business size, rather than race, is felt to be the primary growth challenge to those interviewed
- Minority owned companies desire mentorship
 - Many seek external guidance to better learn how to succeed
 - Many feel they could succeed more they if they “only got the opportunity”
- Minority owned companies seek connections
 - With EGLE: What is available? What am I eligible to apply for? how do I put myself in a position for success?
 - With each other: Unaware of fellow companies in the energy space or limited contact
- Community engagement is crucial to serving minority communities
 - Community leaders need more local and state support to advance their solar promotion work
 - Broadly, perceptions of EGLE are poor in underserved SE Michigan communities



Potential solutions suggested by interviewees

- To Increase the number of minority owned businesses in solar energy:
 - Approach and encourage minority-owned companies in sustainability to pivot into solar energy
 - Pull from “Sustainability Pool of Talent” (short term)
 - Develop talent early on (e.g. in high school and college) (long term)
- To help put small minority-owned companies in a better position to win more PO’s, link minority-owned firms with more established companies to:
 - Provide guidance on what it takes to get the large contract, and
 - How they might work together to pursue new opportunities
- To help create a minority-owned renewable energy community appraised of opportunities:
 - With EGLE: Email listservs, webinars, local forums
 - With each other: Sponsor & support an energy community group for people and companies to connect
- To provide mentorship that yields meaningful (i.e. profitable) results:
 - Set up business accelerators focused on needs of small minority-owned businesses
 - Connecting to larger companies/potential customers for guidance, feedback, and opportunities
- To better support community leaders:
 - Provide public, financial and other support that leverages community leaders’ direct engagement with and understanding of their communities



EGLE can work with minority owners to advance sustainability

- Almost all interviewed expressed enthusiasm for working with EGLE
 - Regardless of any past reservations
 - There were realistic expectations on what EGLE can/cannot do
- All interviewed are:
 - Willing to provide guidance/advice on how they think EGLE can contribute
 - Wish to help other companies and contribute to underserved communities
- All interviewed indicated they would welcome a direct conversation with EGLE



Supplement: Michigan Commercial & Industrial DOE Technology Plans



Report Outline

Introduction

- DOE Structure and Spending Overview

Discussion of specific initiatives and goals

- Advanced Manufacturing

- Building Technologies

- Solar Energy

- Wind Technology

- Geothermal

- Hydrogen and Fuel Cell

- Energy Storage

Integration of DOE and MI Healthy Climate Plan

Recent Legislation



Introduction

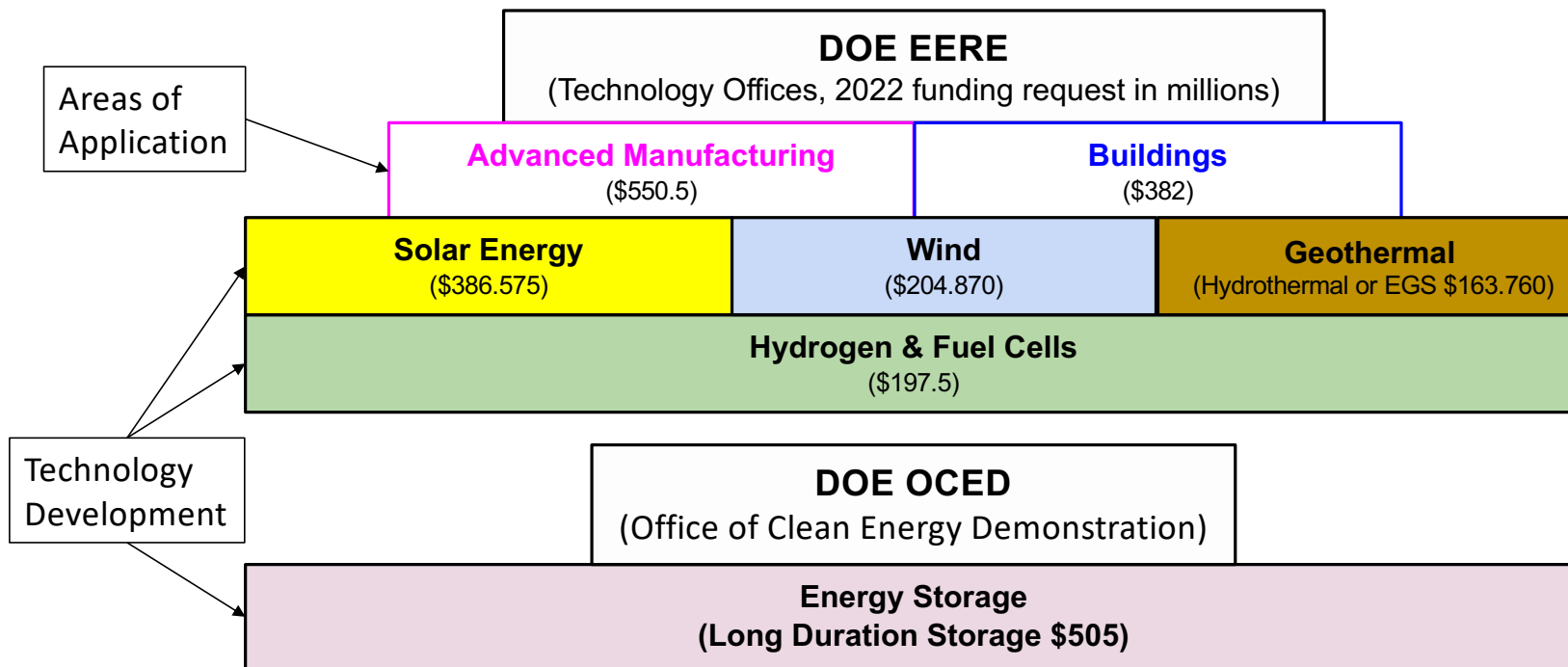
DOE Decarbonization Structure and Spending

The DOE has a goal to accomplish “net-zero greenhouse gas emissions economy-wide by no later than 2050”. (This was prior to the BILL, CHIPS, and IRA legislation.)

The budget request for EERE for 2022 is \$4.7 billion, a large portion of which will go to programs that will be directed at this de-carbonization goal.



DOE Decarbonization Structure and Spending





Advanced Manufacturing Technology Office

AAMO has a goal to get to “near-zero” GHG emissions by 2050. They have identified four major areas of development which are Energy Efficiency, Industrial Electrification, Low Carbon Fuels, Feedstocks and Energy Sources, (LCFFES) and Carbon Capture, Utilization and Storage (CCUS).

The goals for the percent reduction in GHG emissions are distributed approximately equally between efficiency, switch to electricity and other low carbon energy sources, and carbon capture.

Specific initiatives are shown on the following page.

Note that in the Low Carbon Fuels section of the graph, Hydrogen and Energy Storage account for a large portion of the initiatives.

The use of Hydrogen and Hydrogen compounds (Ammonia) as “Green” alternative fuels are viable “Fuel Switching” alternatives.

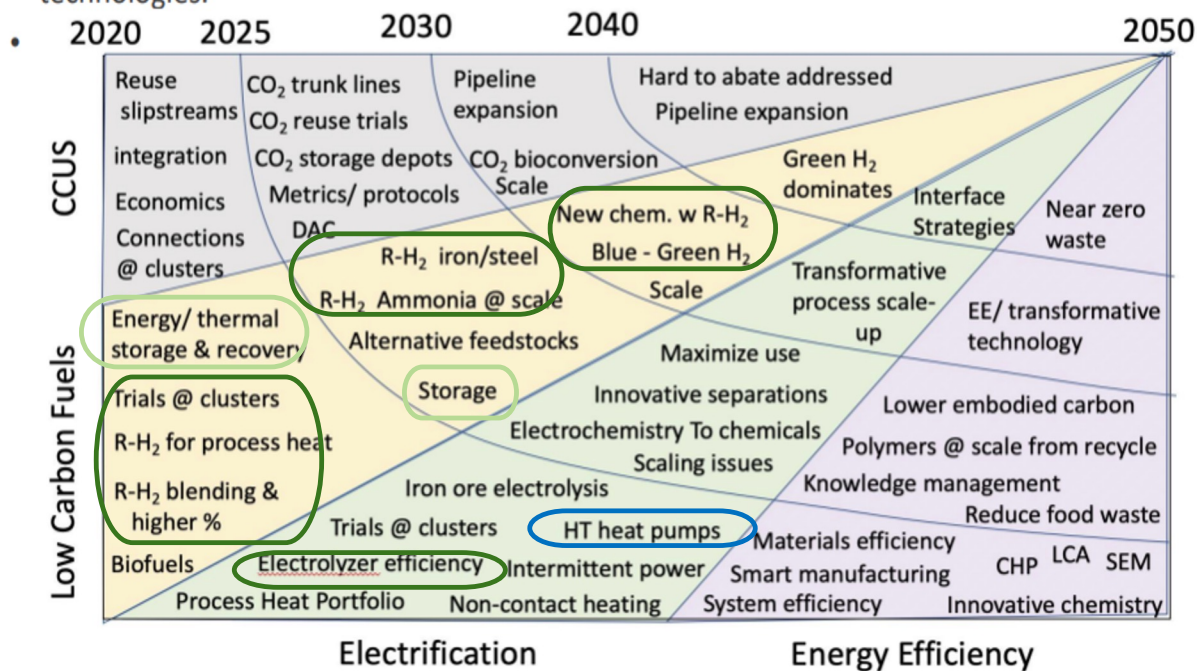
Energy/thermal storage & recovery comes in as a strategy to capture “waste” heat from a process for further use to meet heat requirements for secondary applications.



Advanced Manufacturing Technology Office

RD&D investment needs and opportunities

- A wide range of investments is needed across multiple cross-cutting and sector specific technologies.



Industrial Decarbonization: Opportunity, Challenges and RD&D Needs Joe Cresko – Chief Engineer Advanced Manufacturing Office, US DOE joe.cresko@ee.doe.gov

FINAL DRAFT



Building Technologies Office

The BTO has a stated goal to “Reduce building energy use by 50% (compared to a 2010 baseline)”. “Energy Efficiency Starts Here” Roland Risser – Director, BTO

Specific projects that have been funded include the following

Heat Pumps

- Improved Efficiency
- Low GWP refrigerants
- Unobtrusive Packaging
- Air to air/water optimization
- Optimized cold climate heating

Efficiency

- Daylighting via light pipes
- Improved insulation materials
- Improved Dehumidification concepts
- Active and improved fenestration

Thermal Storage

- Phase Change Materials for
 - Improved HVAC efficiency
 - Load leveling (heating and cooling)

Controls

- Improved sensors
- Need based light and HVAC (occupant sensing)
- Prognostics
- HVAC leveling within a building
- Community level building(s) controls
- Cyber security
- Modeling and simulation



Solar Energy Technology Office

SETO has identified areas of cost for implementation of solar system implementation to include “Soft Costs”, “Hardware Costs”, “Electrical Balance of system Costs”, “Structural Balance of System, and “Permitting, Inspection and Interconnection”. Some specific goals for cost reductions to help address some of those areas are as follows.

Photovoltaics

Goal: LCOE <\$0.03/kWh utility, <\$0.10/kWh resi. by 2030

Concentrating Solar-Thermal

Goal: Solar-thermal electricity with $\geq 50\%$ efficiency

Goal: A TES system with round-trip efficiency of $>50\%$

Systems Integration

Goal: Reliable operation in a system with 75% power from inverter-based sources (solar, wind, and storage)

Manufacturing & Competitiveness

Goal: 1 GW/year of new U.S. PV manufacturing capacity based on new technology (not commercialized in 2020)

Goal: The solar hardware installed in the U. S. has $>40\%$ domestic value

Soft Costs

Goal: A well-supported and diverse solar workforce

Goal: 100% of U.S. energy consumers can choose residential solar or community solar that does not increase their electricity cost



Wind Technology Office

Areas of development for wind generation include:

Technology R&D, & Testing

- Analysis and Modeling
 - Performance modeling and predictive estimates
 - Turbulent wake interaction modeling
- Atmospheric Science
 - Weather prognostics
 - Windfarm controls - wake steering
- Distributed Wind
 - Small & medium size turbine implementation
 - μ Grid control, integration and cybersecurity
 - Defense & disaster deployable
- Materials and Manufacturing
 - Carbon fiber, Additive mfg., Joining tech., Reliability improvement
- Offshore specific Wind R&D, Demonstrations
 - Reduced cost, High efficiency, U.S. mfg.,

Environmental, Siting, Workforce and Grid

- Environmental Research
 - Solutions to wildlife challenges both on and offshore
- Grid Integration
 - Transmission adequacy
 - Grid reliability and cybersecurity
- Regulatory and Siting
 - Eliminate radar interference (utility)
 - Permitting, zoning, ordinance (distributed)
- Stakeholder Engagement & Workforce
 - Optimize deployment decisions
 - Ensure availability of a robust workforce



Geothermal Technology Office

The Geothermal Technology Office is mainly concerned with “Hot Rocks” geothermal. Michigan is not well suited for this mode of energy production because the “Hot Rocks” in this area of the country are too far below ground to be viably accessible.

Ground Sourced and Air Sourced Heat pump Geothermal is included under the BTO and Michigan is very well suited for this type of energy production.



Hydrogen & Fuel Cells Technology Office

Some specific areas of pursuit in this area include:

- **Hydrogen Production** “Hydrogen Shot” goal: - \$1 for 1kg of clean hydrogen in 1 decade

- Water-Splitting (electrolysis, catalytic)
- Biomass & waste-stream resources
- Fossil resources

- **Hydrogen Delivery**

- Trailers & pipelines
- Liquid H₂
- Chemical H₂ carriers

- **Hydrogen Storage**

- Physical based
- Material based

- **Hydrogen Conversion**

- Combustion
- Fuel Cells

- **Hydrogen Applications**

- Transportation
- Chemical and Industrial Processes
- Power generation
- Integrated hybrid energy systems

- **Crosscutting Challenges & Opportunities**

- Component and system level integration
- System controls including cybersecurity
- Scale-up
- Harmonized codes and standards



Energy Storage Office

In December 2020, the U.S. Department of Energy (DOE) released the Energy Storage Grand Challenge Roadmap, and in September of 2021 they introduced the Long Duration Storage Shot. Specific goals of these programs include:

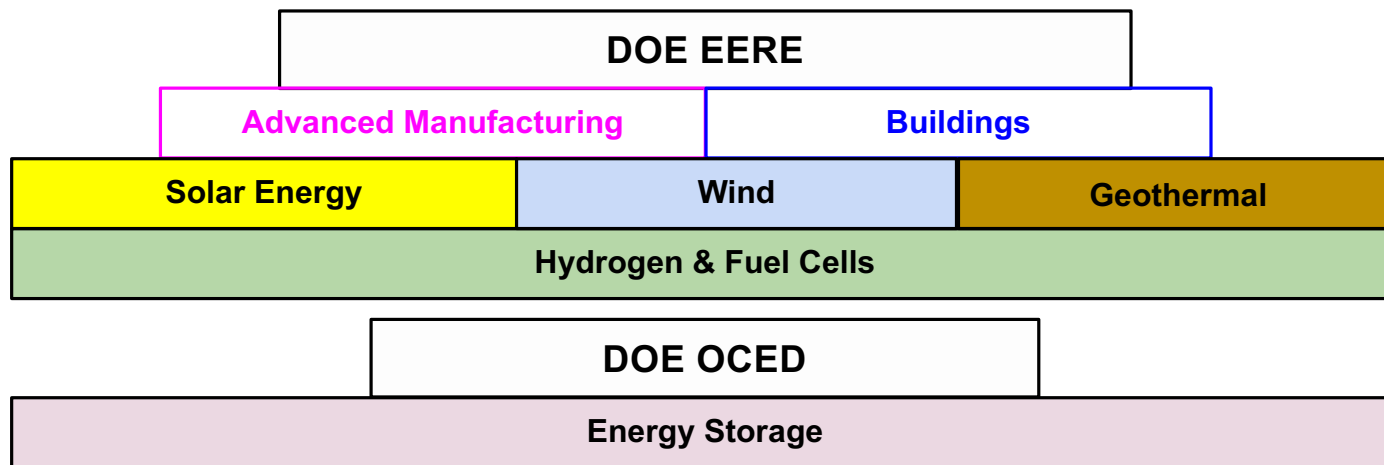
- Energy Storage Grand Challenge
 - The Grand Challenge covers a wide range of forms of energy storage
 - One specific goal for batteries is \$80/kWh manufactured cost for a battery pack by 2030 for a 300-mile range electric vehicle, a 44% reduction from the current cost of \$143 per rated kWh.
- Long Duration Storage Shot
 - \$0.05/kWh levelized cost of storage for long-duration (10+ hours) stationary applications, a 90% reduction from 2020 baseline costs by 2030

<https://www.energy.gov/sites/default/files/2020/12/f81/Energy%20Storage%20Grand%20Challenge%20Roadmap.pdf>

<https://www.energy.gov/articles/biden-administration-launches-bipartisan-infrastructure-laws-505-million-initiative-boost>



DOE Initiatives Recap.



EGLE's goal of decarbonizing manufacturing processes and commercial buildings is clearly supported by multiple DOE initiatives.



For More Information

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THANK YOU!

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