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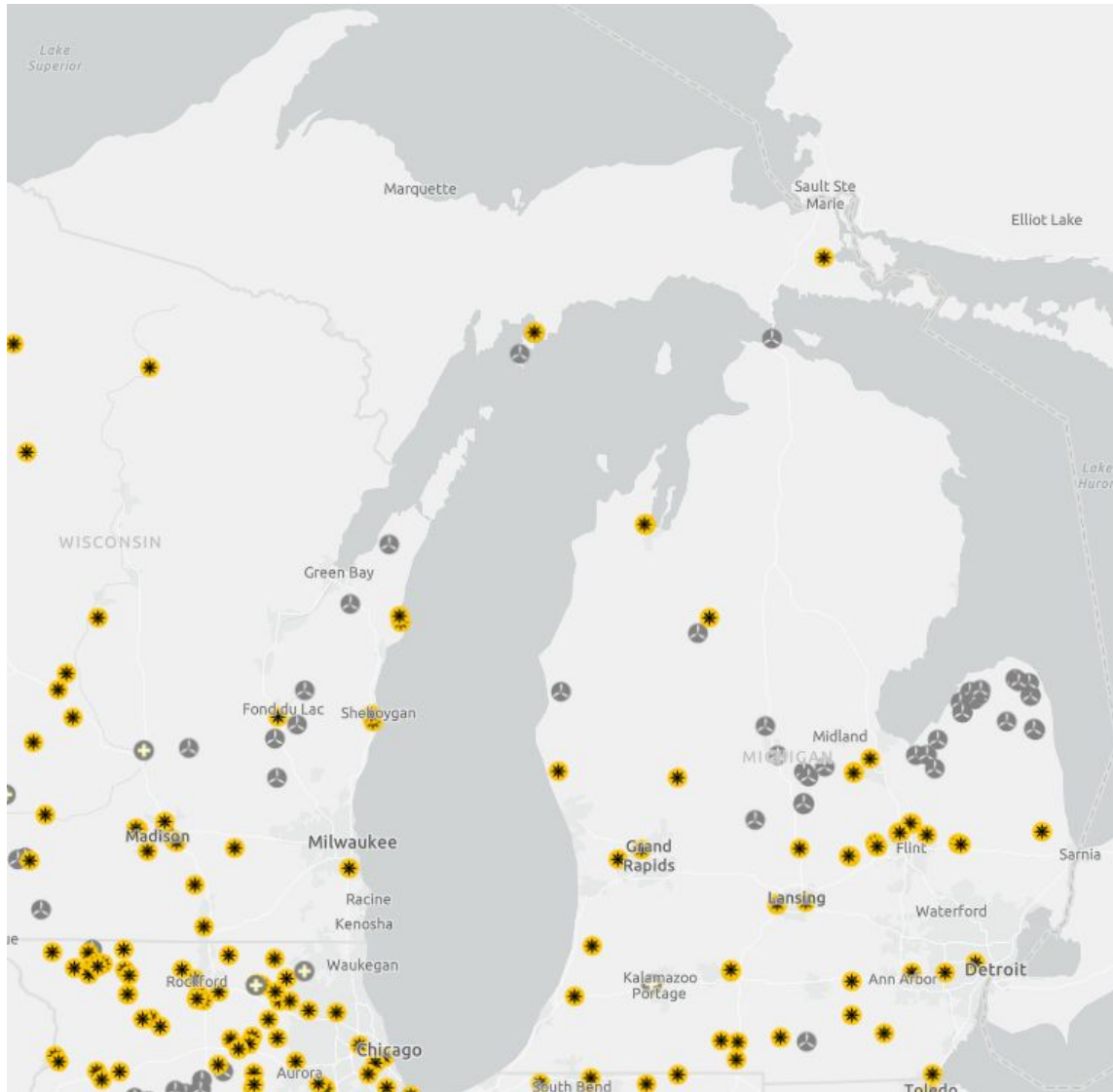
Renewable Energy Tour

What You Need to Know About Renewable Energy

Sarah Mills, PhD
Madeleine Krol

July 2024

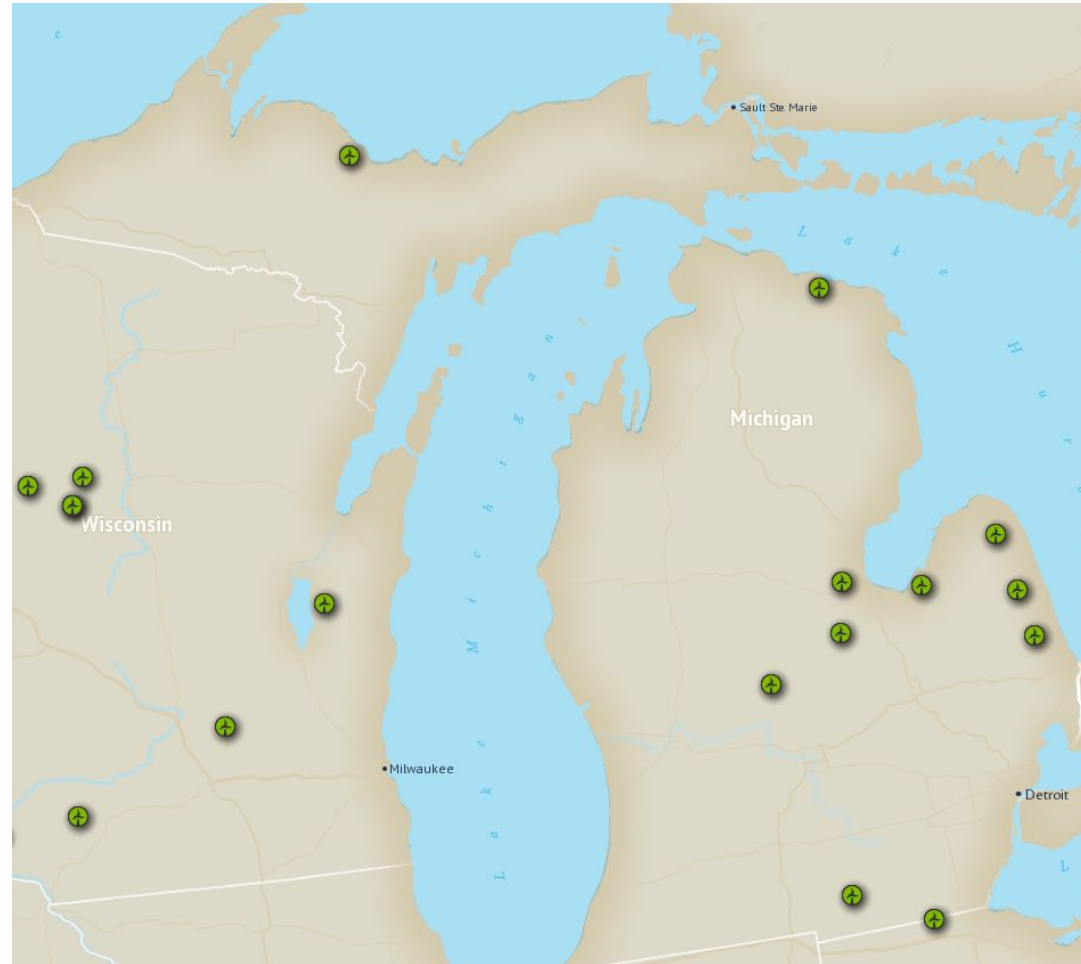
Existing utility-scale wind & solar 3,951 MW



3,242 MW Wind
709 MW Solar

Source: U.S. Energy Mapping System, June 10, 2024
<https://www.eia.gov/state/maps.php>

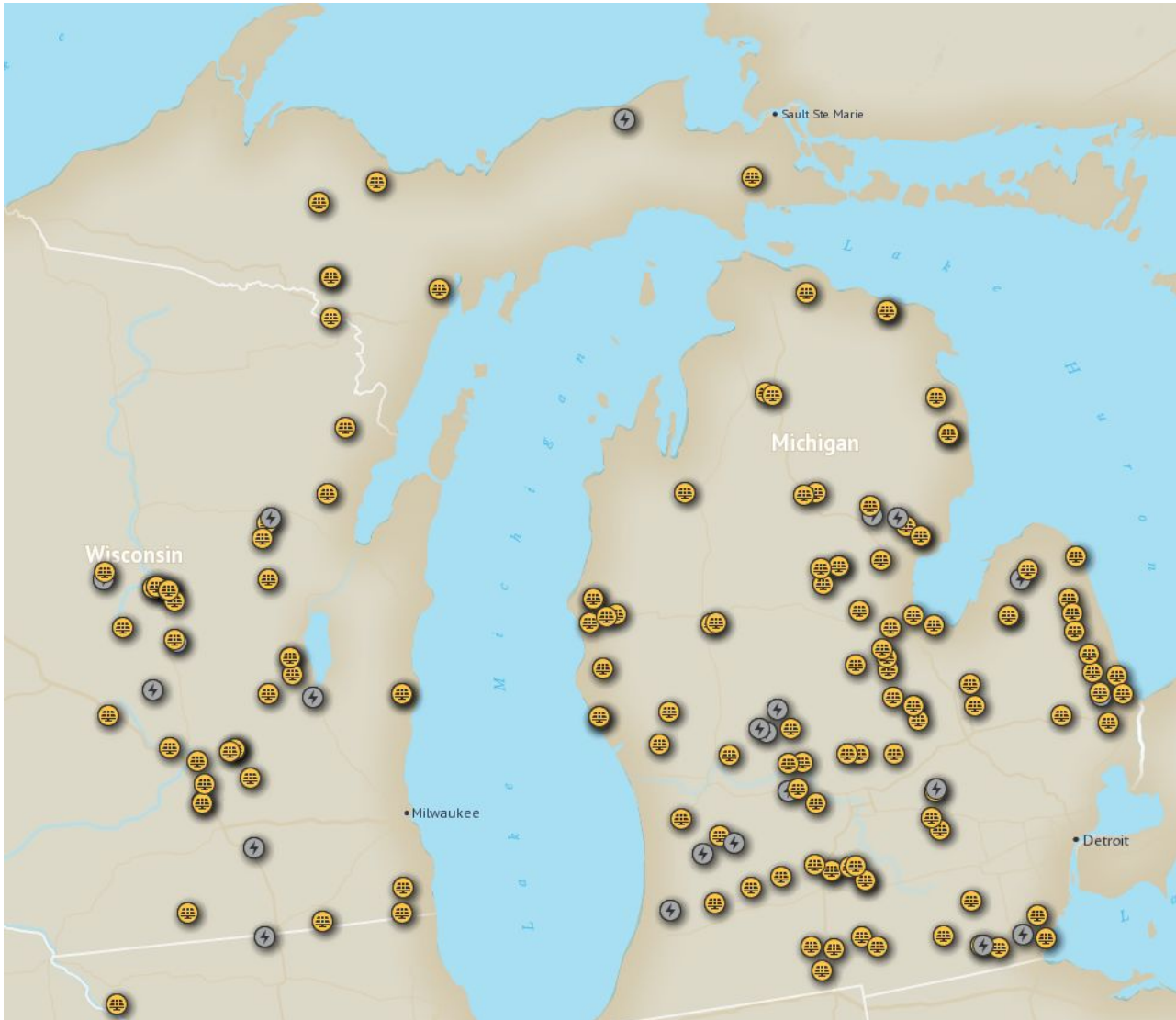
Wind being considered: 10 projects, 1,962 MW



Source: MISO Queue, June 10, 2024

<https://api.misoenergy.org/PublicGiQueueMap/index.html>

(Large) Solar being considered: 113 projects - 18,700 MW

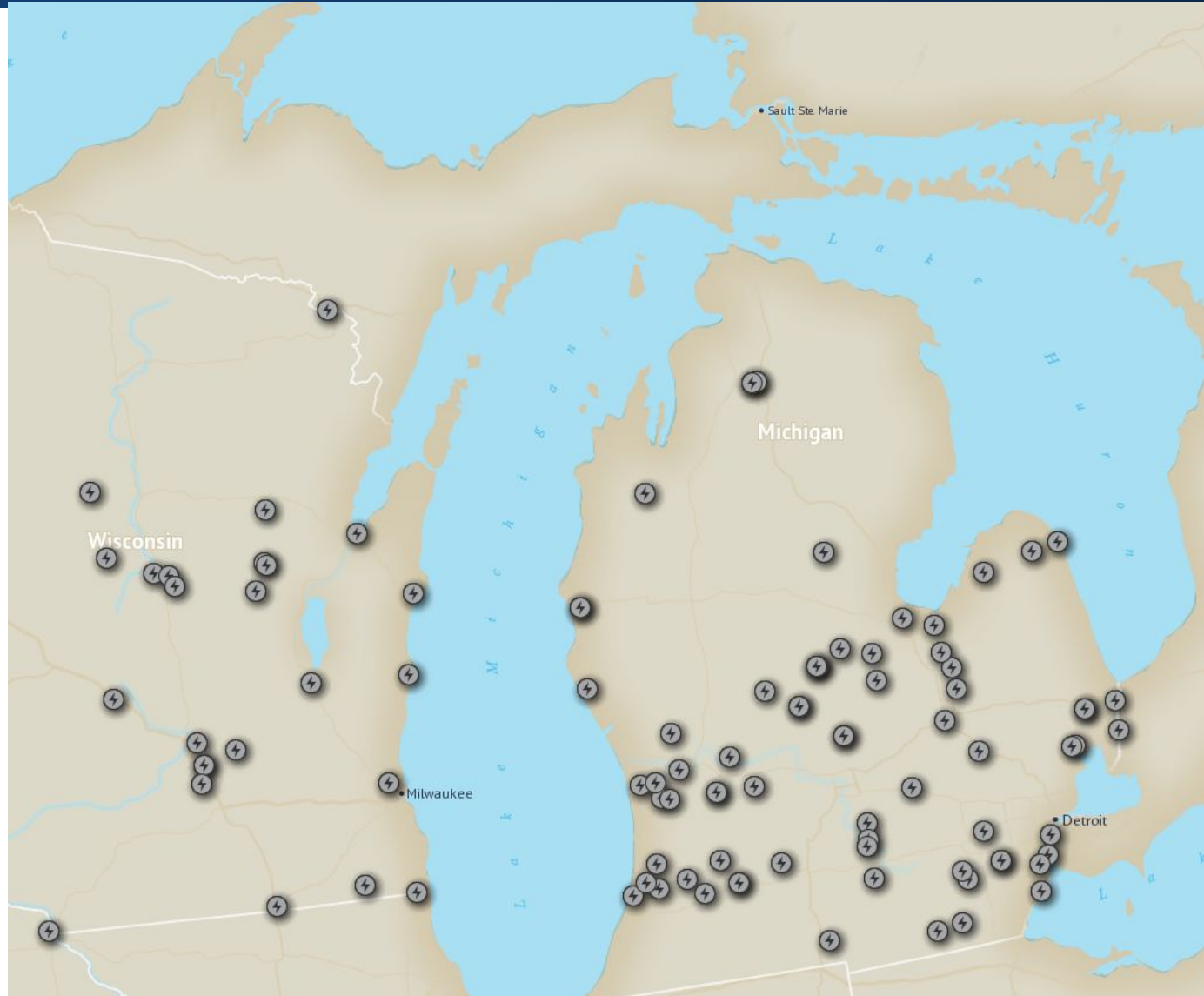


15,552 MW Solar
3,148 MW Hybrid

Source: MISO Queue, June 10, 2024
<https://api.misoenergy.org/PublicGiQueueMap/index.html>

Standalone battery energy storage, too!

71 Projects – 11,565 MW



Source: MISO Queue, June 10, 2024
<https://api.misoenergy.org/PublicGiQueueMap/index.html>

November 2023 bill package on energy

- **PA 233 (HB5120)**
 - MPSC siting authority for large projects
- **PA 234 (HB5121)**
 - MZEA
 - Nonconforming status to approved projects
- **PA 235 (SB 271)**
 - Increase rooftop solar cap to 10%
 - Renewable energy: 50% x 2030; 60% x 2035
 - Clean/carbon-free: 80% x 2035; 100% x 2040
 - 2,500MW energy storage by 2029
- Other bills on energy efficiency, IRP criteria, public engagement, just transition



Even prior to bills, utilities planned for more renewables



March 25, 2022 11:03 AM | UPDATED 32 MINUTES AGO

Utilities on the hunt for thousands of acres for solar development

CHAD LIVENGOOD  

Consumers (2021 IRP)
64-80,000 acres
by 2040

DTE (2022 IRP)
52-65,000 acres
by 2042

Why so much activity?



IRPs calling for 4x increase in renewables (hedge for future fuel costs)

Technology (wind), cost reductions (solar) making renewables possible statewide



Photo by RawFilm of Unsplash

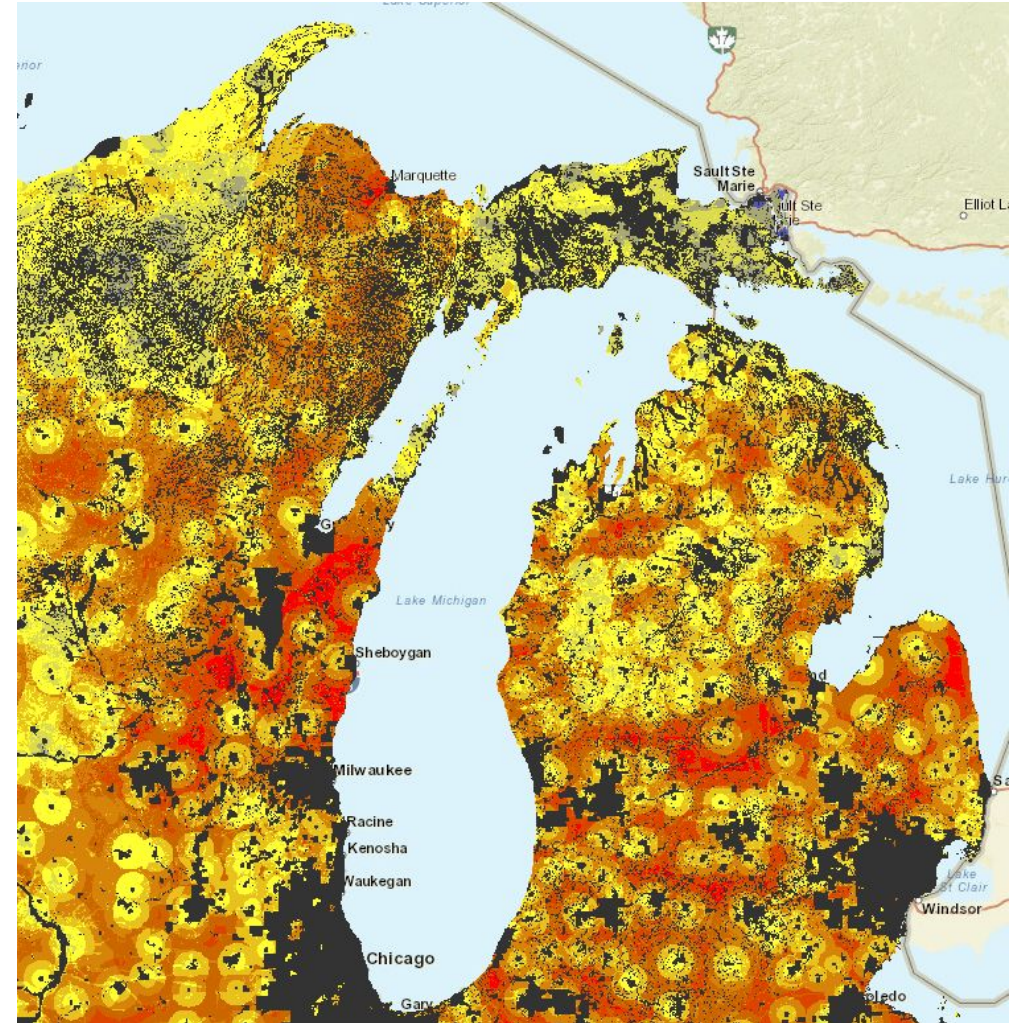
WHAT YOU NEED TO KNOW ABOUT WIND ENERGY

Different scales



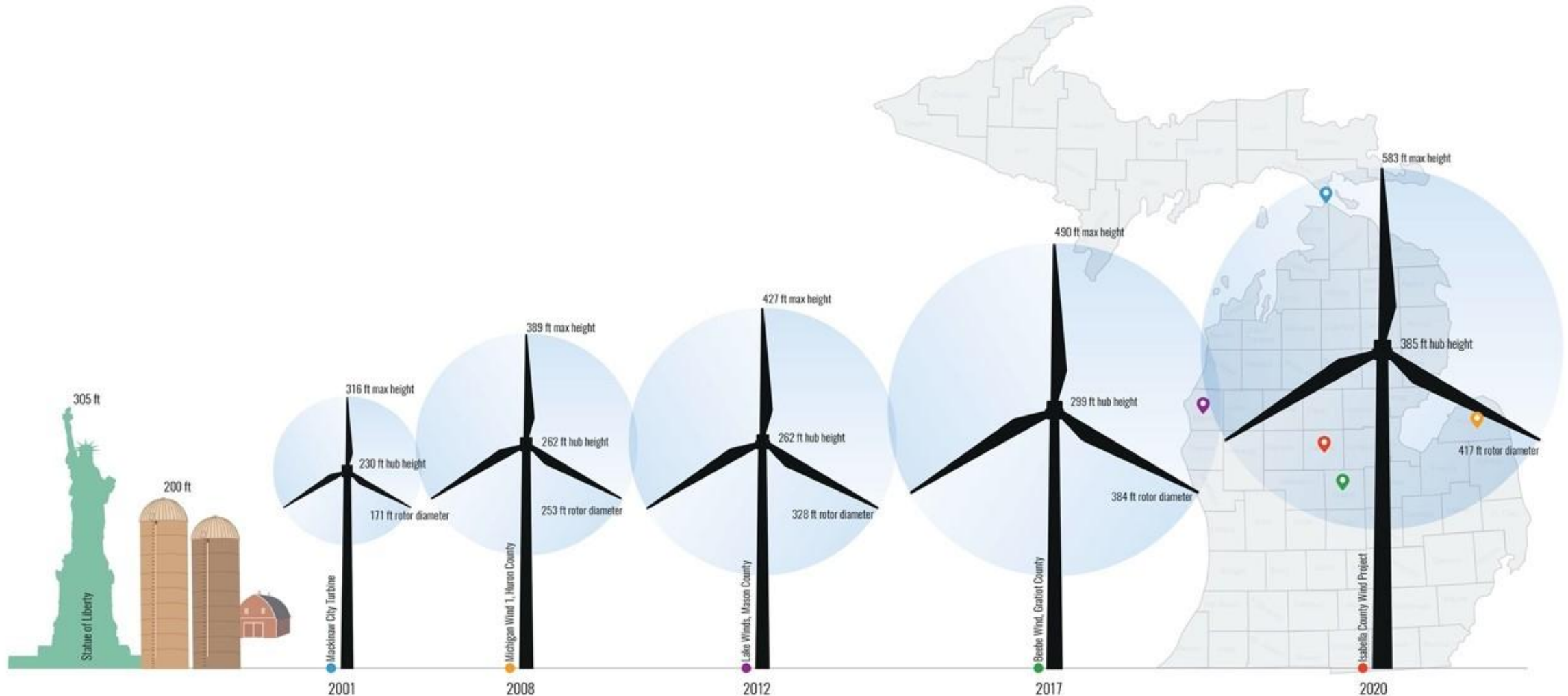
Where is utility-scale wind development possible?

- Good wind resource (though relatively easy)
- Looking for access to transmission
- Avoid endangered species
- Away from urban areas
 - Not enough open land
 - Wind disruption



Wind turbine heights over time

Wind Turbine Size: Michigan



Wind energy

Local Benefits

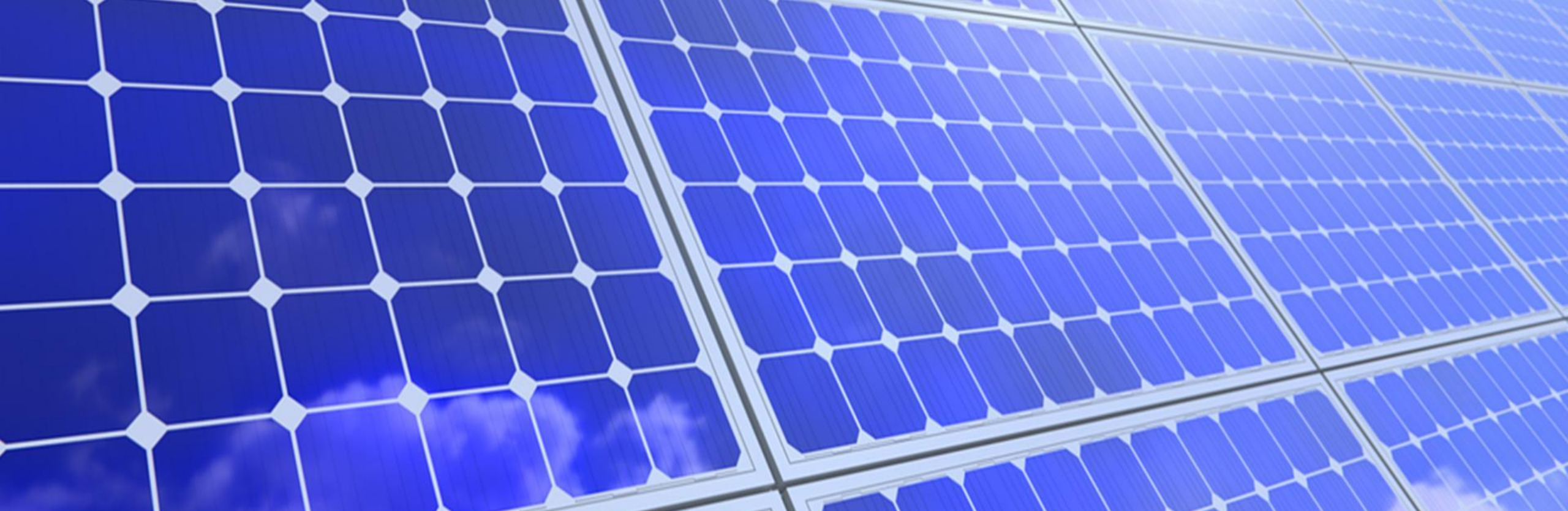
- Landowner payments
 - Farm reinvestment
 - Farm succession
 - Not just farmers
- Tax payments, developer donations (caveat)
- Renewables Ready Communities Award
- Jobs (caveat)

Local Concerns

- Noise / health
- Wildlife
- Visual Impacts
 - Outright
 - On property values
- “Not why I moved here”












Bottom line on wind

- Wind = economic development
- If goal is to sustain agriculture, wind can fit
- If goal is for substantial residential development or growth of tourism, wind may not be right



WHAT YOU NEED TO KNOW ABOUT SOLAR ENERGY

Solar is scalable across all landscapes

Solar Energy System Type	Natural	Rural	Urban	General Urban
Accessory Roof Mounted				
Accessory Ground Mounted				
Principal Use (Small)				
Principal Use (Large)				

Shifting scale of utility-scale solar

	Existing	Proposed
Avg	11 MW	160 MW
Avg acres	55-88 acres each	800-1,600 acres each
Max	239 MW	500 MW
Max acres	1,900 acres (7.9 acres/MW)	2,500-5,000 acres



Photo: Assembly Solar in Shiawassee County, MI: <https://www.youtube.com/watch?v=tnHvagJnic4>

Solar: New threat or opportunity?



Local

Proposed solar energy developments draw opposition over loss of farmland



Business

The next money crop for farmers: Solar panels



What are you trying to preserve?

- Urban boundary
- Rural vista
- Habitat
- Land for growing food
- Farm livelihoods



What are you trying to preserve?

- **Urban boundary**
- Rural vista
- Habitat
- Land for growing food
- Farm livelihoods
- Land occupied 30+ years
- No demands on services
- **Contributes to taxes**
 - Payment in lieu of taxes (PILT)
- **Renewables Ready Communities Award**
 - One-time payment from state

What are you trying to preserve?

- Urban boundary
- **Rural vista**
- Habitat
- Land for growing food
- Farm livelihoods



Source: Anthony Wahl/Janesville Gazette
https://mtribune.com/agriculture/farming-land-surrounded-by-solar/article_4159269a-boco-559e-aad5-fcb561b20fb8.html

What are you trying to preserve?

- Urban boundary
- Rural vista
- **Habitat**
- Land for growing food
- Farm livelihoods



<https://www.nature.org/en-us/about-us/where-we-work/united-states/north-carolina/stories-in-north-carolina/making-solar-wildlife-friendly/>

What are you trying to preserve?

- Urban boundary
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Grazing possible

Other crops niche at the largest scale for medium term; research proposed!



What are you trying to preserve?

- Urban boundary
- Rural vista
- Habitat
- Land for growing food
- Farm livelihoods
- Is solar reversible?
 - Depends on land use requirements
 - Decommissioning
- Will panels contaminate the land?
 - Recycling of panels
- Long-term impacts of idle land?

Source:
<https://graham.umich.edu/product/clean-energy-michigan-series-facts-about-solar-panels-pfas-contamination-no-12>



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DOE-funded Research (2021-2024)

- How much solar land is leased vs. purchased?
- What are leaseholders doing with revenue?
 - How does lease revenue recirculate in local economy?
 - Retirement vs. farm diversification
- Comparison of solar to ag (inputs, taxes)

Future research

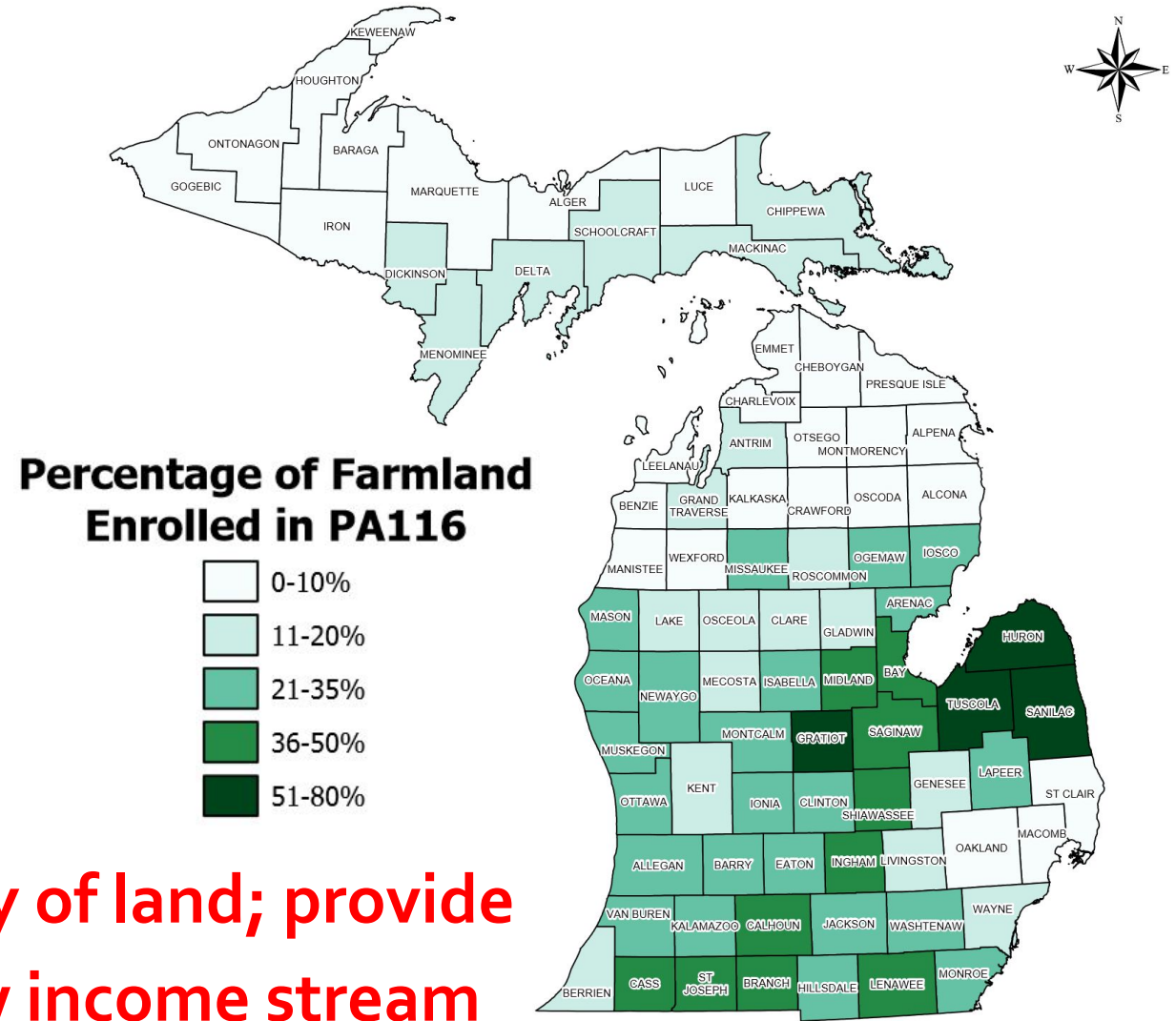
- Prevalence of neighbor payments
- Impacts on tenant farmers

Solar on PA 116 land

State allows solar if:

- Field tile is maintained,
- Cover crop is planted that includes pollinator habitat, and
- Surety bond or letter of credit with the state to ensure solar panels will be removed and the land returned to a condition in which it can be farmed.

Aim to protect long-term farmability of land; provide farmers/farm communities with new income stream



To summarize: Solar benefits and concerns

Local Benefits

- Landowner payments
- Tax payments
- Renewables Ready Communities Award
- Jobs (caveat)

Local Concerns

- Wildlife (?)
- Visual Impacts
- Wise use of land; impacts on tenant farmers

Typical ground cover



National Renewable Energy Laboratory

E.ON Climate and Renewables



Dual use SES

Conservation Cover:

Solar sites designed in consultation with conservation organizations that focus on restoring native plants, grasses, and prairie with the aim of protecting specific species (e.g., bird habitat) or providing specific ecosystem services (e.g., carbon sequestration, soil health).

*Planning & Zoning for Solar Energy Systems:
A Guide for Michigan Local Governments*



Credit: Charles Gould

Dual use SES

Pollinator Habitat:
Solar sites designed to meet a score of 76 or more on the Michigan Pollinator Habitat Planning Scorecard for Solar Sites.

Michigan Pollinator Habitat Planning Scorecard for Solar Sites
This form was developed by the MSU Department of Entomology to guide vegetation management at solar installations to make them more supportive for native pollinators. Check the boxes and add up the points to determine whether the plans meet or exceed the minimum requirements. For more local information on pollinators and habitat: www.pollinators.msu.edu

PROJECT DETAILS
Solar developer: _____
Vegetation consultant: _____
Project location: _____
Project size (acres): _____

SITE SCORES

1. SITE PLANNING AND MANAGEMENT

- Detailed plant establishment and vegetation management plan developed +10 pts
- Site plan developed with a vegetation management company + 5 pts
- Signage legible at forty or more feet stating pollinator friendly solar habitat +3 pts

2. HABITAT SITE PREPARATION PRIOR TO IMPLEMENTATION

FLOWERING PLANT SCORES

5. FLOWERING PLANT SPECIES SEEDED IN PERIMETER AREA (species with more than 1% cover)

- 5-10 species +1 pts
- 10-15 species +3 pts
- 16-20 species +8 pts
- >20 species +10 pts

Exclude invasive plant species from total

6. PLANT DIVERSITY UNDER SOLAR ARRAY*

- Grass only +2 pts
- Clover/grass mix +8 pts
- Low-growing wildflower mix +10 pts

7. PERCENT OF SITE PLANNED TO BE DOMINATED BY WILDFLOWERS**

- 0 - 25% 0 pts
- 26- 50 % +3 pts
- 51-75 % +8 pts
- More than 75% +15 pts



Dual use SES

Forage:

Solar sites that incorporate rotational livestock grazing and forage production as part of an overall vegetative maintenance plan.



*Planning & Zoning for Solar Energy Systems:
A Guide for Michigan Local Governments*

Credit: M. Reilly

Dual use SES

Agrivoltaics:

Solar sites that combine raising crops for food, fiber, or fuel, and generating electricity within the project area to maximize land use.



*Planning & Zoning for Solar Energy Systems:
A Guide for Michigan Local Governments*

Credit: M. Reilly

Bottom line on rural (ag) solar

- Solar = economic development
- Where land is of marginal quality, no-brainer
- Where ag-based economy with prime soils
 - Solar as short- or long-term land use?



WHAT YOU NEED TO KNOW ABOUT BATTERY ENERGY STORAGE SYSTEMS (BESS)

Michigan's current storage

Ludington Pumped Storage Plant

Capacity: 2,292 MW



Source: Consumers Energy, 1/18/2023
https://www.consumersenergy.com/-/media/CE/Images/Content%20Images/slideshow-images/Slides%20Images/Ludington_overhead_view.ashx

Parkview Battery Project, Western Michigan University (only utility-scale battery in the state)

Capacity: 1 MW, hybrid wind and solar



Source: DBusiness, 1/18/2023
<https://www.dbusiness.com/daily-news/jacksons-consumers-energy-starts-operation-of-large-scale-battery-at-kalamazoos-western-michigan-university/>

What batteries are we talking about: Scales



Residential battery: Tesla Powerwall

Source: <https://www.governing.com/infrastructure/virtual-power-plants-are-coming-to-save-the-grid>



Battery modules installed on racks in enclosure: Manatee Energy Center, FL

Source: <https://www.energy-storage.news/worlds-biggest-solar-charged-battery-storage-system-unveiled-in-florida/>



2 MW: Agrekko/National Grid U.S., NY

Source: shorturl.at/admsu



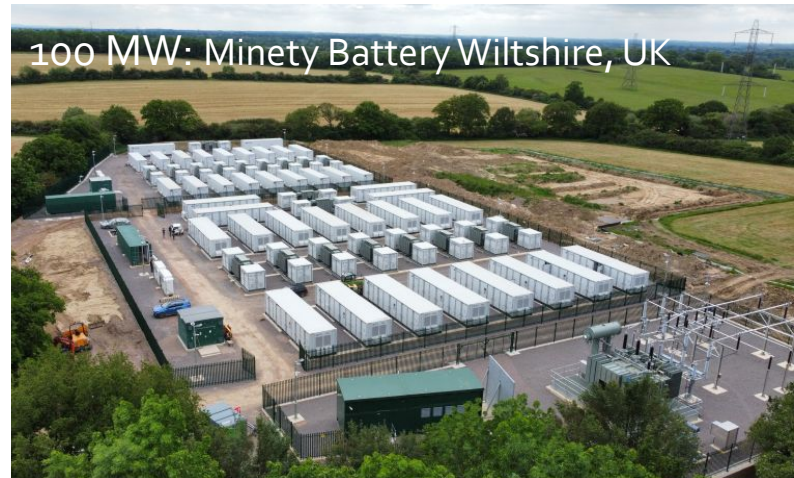
8 MW: Tehachapi Energy Storage Project, CA

Source: shorturl.at/irBSV

What batteries are we talking about: Scales



Source: <https://www.blattnerenergy.com/projects/northern-il-energy-storage-project>



Source: <https://cdn.aiidatapro.net/media/a3/e3/57/t780x490/a3e357ddd9b91ca428dc8f157278773.webp>



Source: <https://www.energytech.com/energy-storage/article/21236654/nearly-1gw-combined-slate-solar-storage-project-operational-in-northern-california>



Source: <https://www.dbusiness.com/daily-news/dte-energy-to-build-largest-standalone-battery-energy-storage-project-in-great-lakes-region/>



Source: <https://www.sfchronicle.com/business/article/Monterey-Bay-power-plant-now-a-record-breaking-15872503.php>

How big are utility-scale BESS?

	Battery alone	Hybrid
MW span	25-500 MW	100-499 MW
MW average	149 MW	198 MW
Acres average	~0.03-0.1 acres/MW ~5-15 acres	5-8 acres/MW ~1000-1600 acres
Acres max	~50 acres	2,500-4,000 acres

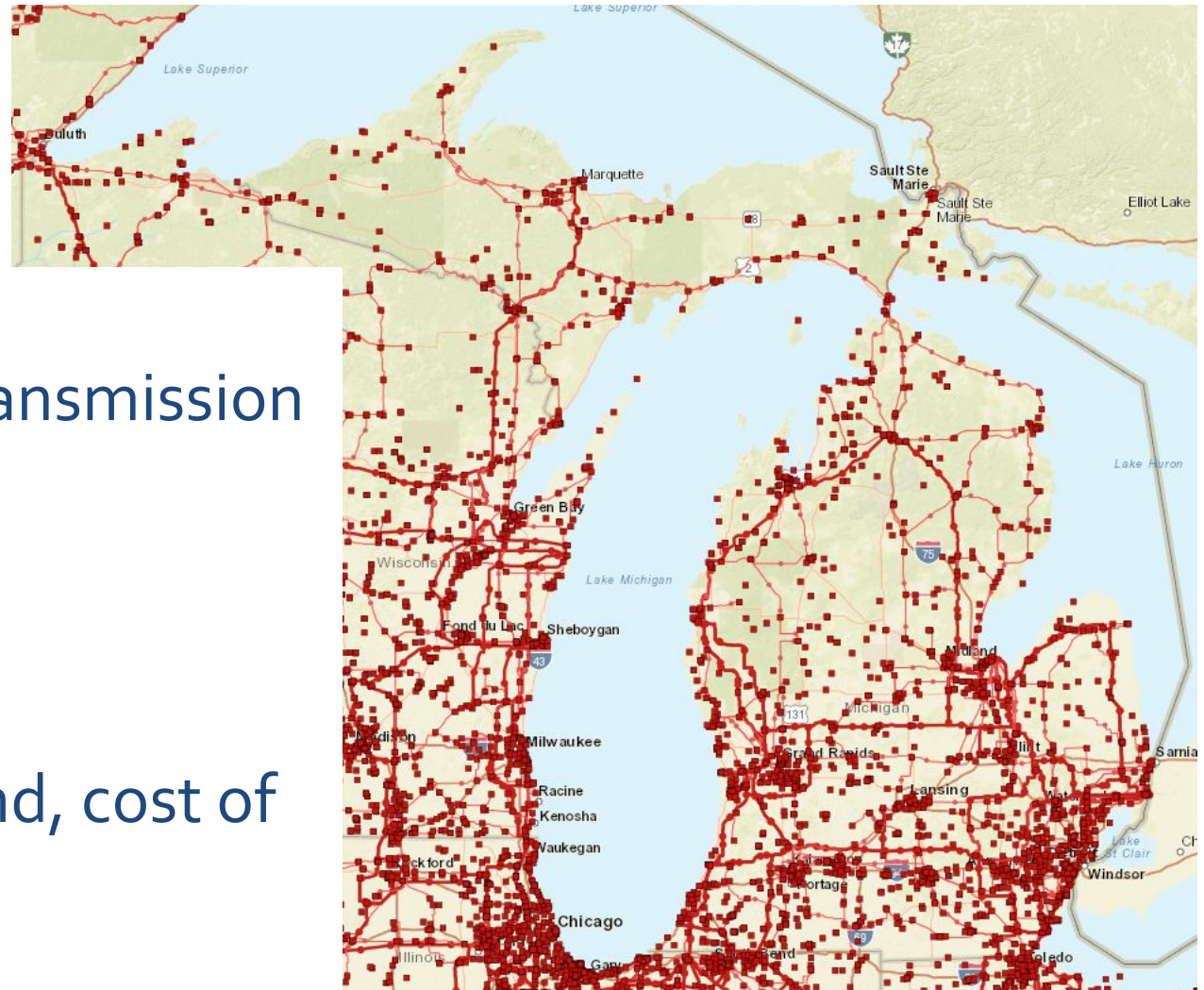


Source: SaurEnergy, 1/20/2023

<https://img.saurenergy.com/2022/09/largest-battery-energy-storage-systems.jpg>

Where is BESS possible?

- **Grid access is key**
 - Large projects feed into transmission via substation
- **Prefer cleared, flat land**
 - A lot of land is viable (small footprint, cost of land, cost of taxes)
 - Brownfields (possible, but limitations)



Source: Geospatial Energy Mapper, <https://gem.anl.gov/tool>

So what are the pros and cons?

Local Benefits

- Small footprint with big tax payments (caveat)
- One-time payment: Renewables Ready Communities Award or Host Community Award
- Landowner payments
 - Opportunity for brownfields(?)
- Jobs (caveat)
- Grid resilience (local or overall grid?)

Local Concerns

- Visual impacts
- Sound
- Environmental impacts
- Fire & explosion risk

Common concern: Fire safety

- **BESS create risks of fire and explosion – and safety mechanisms, mitigation measures, codes and standards are rapidly evolving, improving**
- **Safety systems are designed to prevent thermal runaway**
 - Caused by overcharging, mechanical and thermal abuse, manufacturing defects, improper design/operation
 - Causes rapid process of self-perpetuating excessive heat buildup in battery
 - Can vent flammable/toxic gases or rupture, that can result in fire or explosion

Mitigating safety risk

- **NFPA 855 “Standard for the Installation of Stationary Energy Storage Systems”**
 - Standard also addresses planning and training for local preparedness
- **Emergency and Fire Response Plans:**

Planning and consultation with local first responders to ensure ERP and FRP are in alignment with procedures, capabilities, resources of local first responders

 - Regular review of plans and annual, site-specific training drills with emergency first responders at expense of project owner (FRP)
 - Analysis of whether plans can be fulfilled by existing local emergency response capacity, identification of specific equipment/training needs
- **Application to also include the following in compliance with NFPA 855:**
 - Commissioning Plan (4.2.4 & 6.1.3.2)
 - Emergency Operations Plan (4.3.2.1.4)
 - Hazard Mitigation Analysis (4.4)

Bottom line on utility-scale BESS

- **Battery storage = economic development, (resilience)**
- **High investment on small footprint**
 - But safety concerns, visual change
- **Planning & Zoning for BESS [Guidebook](#)**

Questions?

- **Reach out to us**
 - Answer questions
 - Review draft zoning ordinances
 - Give presentation to township
 - Connect you to MSU-Extension, other communities
- **More training**
 - Renewable Energy Academy
 - Legal training, bus tours through MAP
 - Online webinars on zoning

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