



What you always wanted to know about Wind and Solar Farms

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Bay City Garden Club May 20, 2019

Overview

- Why think about renewable energy?
- Pros & cons of wind
- Pros & cons of solar
- Why zoning matters?





My Background

- PhD in rural land use planning
 - Investigate claims of wind as farmland preservation tool
 - City of Ann Arbor Planning Commissioner
- Research on attitudes about energy, energy policy
- Presentations around Michigan
 - Provide state-based data
 - Neutral broker
 - Funding through Michigan Energy Office



MICHIGAN Energy Office



Why think about renewable energy?



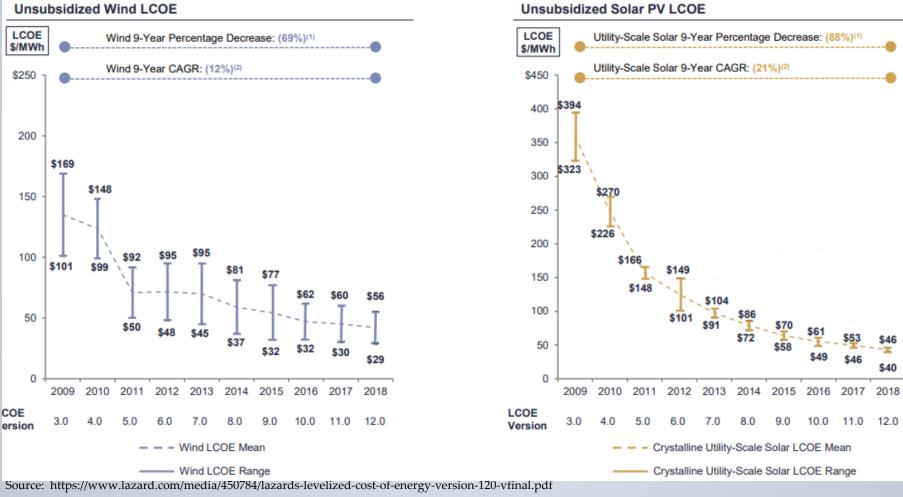


Why talk about renewables?

 Costs are falling; utilities are looking for host communities



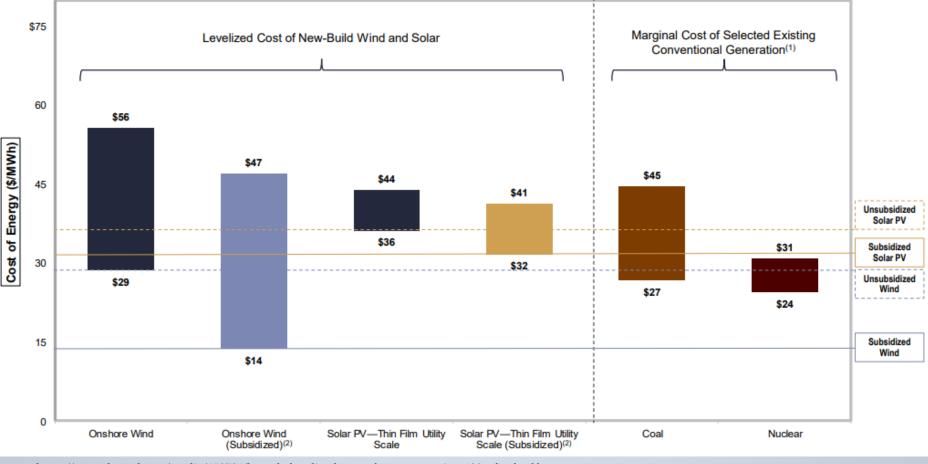
Costs of Wind and Solar Declining







Some wind, solar cheaper than keeping existing plants open



Source: https://www.lazard.com/media/450784/lazards-levelized-cost-of-energy-version-120-vfinal.pdf

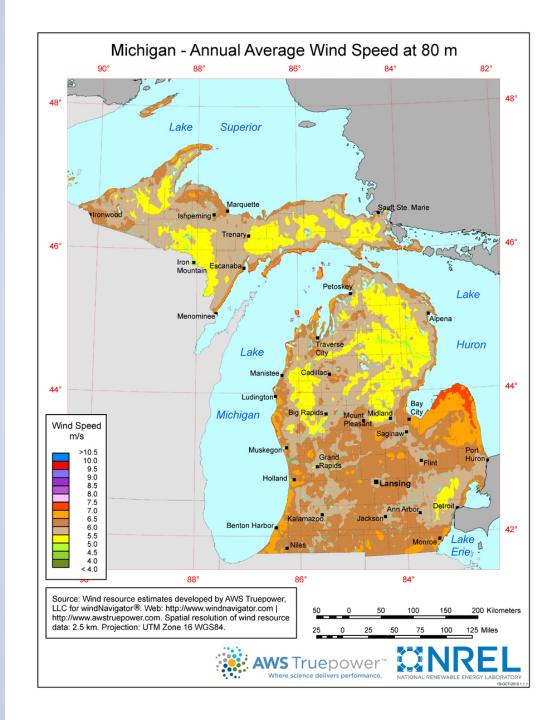




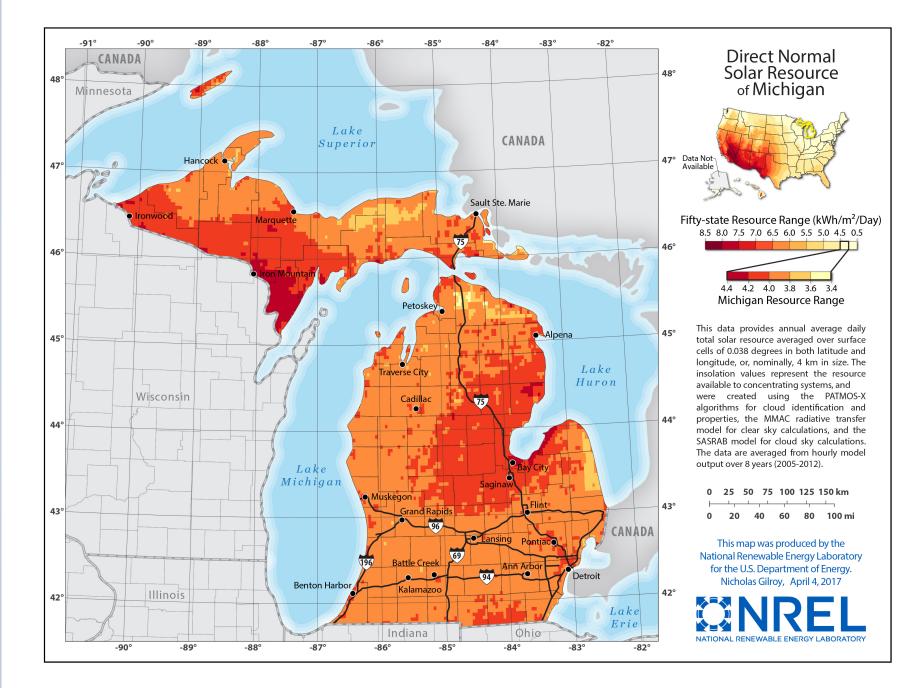
Why talk about renewables?

- 1. Costs are falling; utilities are looking for host communities
- 2. Technology making wind development and solar possible statewide
 - Bay County is particularly windy & sunny





FORD SCHOOL



Why talk about renewables?

- 1. Technology making wind development and solar possible statewide
- 2. Costs are falling so utilities are looking for host communities
- 3. Impacts of climate change will increasingly be felt; fossil fuel electricity part of the problem



Michigan already feeling climate impacts; impacts will increase

- Heavier rain events
- Warming lakes
- Warmer average temperatures

 Longer growing seasons



Michigan's climate is changing. Most of the state has warmed two to three degrees (F) in the last century. Heavy rainstorms are becoming more frequent, and ice cover on the Great Lakes is forming later or melting sooner. In the coming decades, the state will have more extremely hot days, which may harm public health in urban areas and corn harvests in rural areas. Our climate is changing because the earth is warming. People have increased the amount of carbon dioxide in the air by 40 percent since the late 1700s. Other heat-trapping greenhouse gases are also increasing. These gases have warmed the surface and lower atmosphere of our planet about one degree during the last 50 years. Evaporation increases as the atmosphere warms, which increases humidity, average rainfall, and the frequency of heavy rainstorms in many places-but contributes to drought in others.

Greenhouse gases are also changing the world's oceans and ice cover. Carbon dioxide reacts with water to form carbonic acid, so the oceans are becoming more acidic. The surface of the ocean has also warmed about one degree during the last 80 years. Although warmer temperatures cause sea level to rise, the impact on water levels in the Great Lakes is not yet known. Warmer air also meths ice and snow earlier in spring.



Rising temperatures in the last century. Northern Michigan has warmed more than southern Michigan. Source: EPA,

Climate Change Indicators in the United States.

Heavy Precipitation and Flooding

Changing the climate is likely to increase the frequency of floods in Michigan. Over the last half century, average annual precipitation in most of the Midwest has increased by 5 to 10 percent. But rainfall during the four wettest days of the year has increased about 35 percent. During the next century, spring rainfall and annual precipitation are likely to increase, and severe rainsforms are likely to intensify. Each of these factors will tend to further increase the risk of flooding.



Heavy rains and snowmell flooded the Tittabawassee River in Midland in April 2015. Credit: City of Midland,

Great Lakes

Changing the climate is likely to harm water quality in Lake Erie and Lake Michigan. Warmer water tends to cause more algal blooms, which can be unsightly, harm fish, and degrade water quality. During August 2014, an algal bloom in Lake Erie prompted the Morroe Courty Health Department to advise residents in four townships to avoid using tay water for cooking and diriking. Severe shorms increase the amount of pollutants that run off from land to water, so the risk of algal blooms will be greater if storms become more severe. Severe rainstorms can also cause severs to overflow into lakes and rivers, which can threaten beach safety and rinking water supplies. For example, heavy rains in August 2014 led to nearly 10 billion galons of sever overflows in southeastern Michigan, much of which ended up in Lake St. Cali and which could pollute beaches in Michigan.

One advantage of climate change is that warmer winters reduce the number of days that ice prevents navigation. Between 1994 and 2011, the decline in ice cover lengthened the shipping season on the Great Lakes by eight days. The takes are likely to warm another 3° to 7° F in the next 70 years, which will further extend the shipping season.

Why talk about renewables?

- 1. Costs are falling so utilities are looking for host communities
- 2. Technology making wind development and solar possible statewide
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Communities need to decide if renewables are right for THEIR community

Impacts of wind energy on host communities

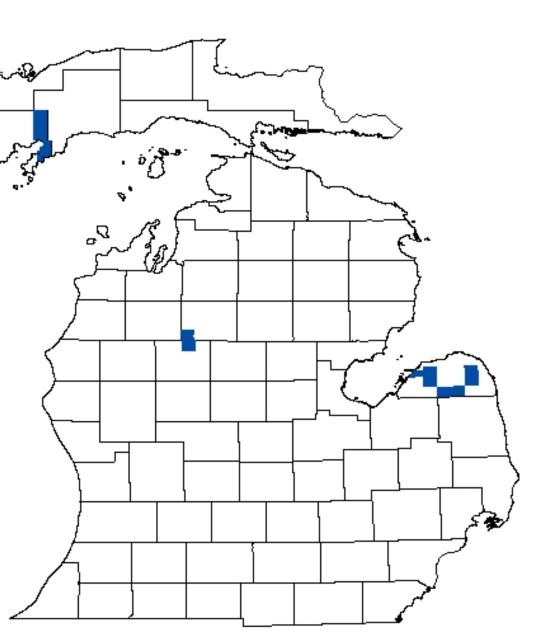
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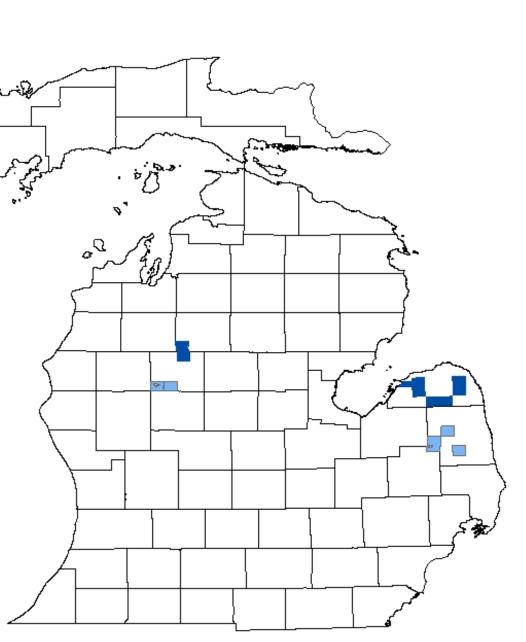
2016 Community Survey

- Owners of land assessed ag or residential
- 10 townships with windfarms
- 2,013 responses (53% response rate)
- Funded by C.S. Mott Foundation





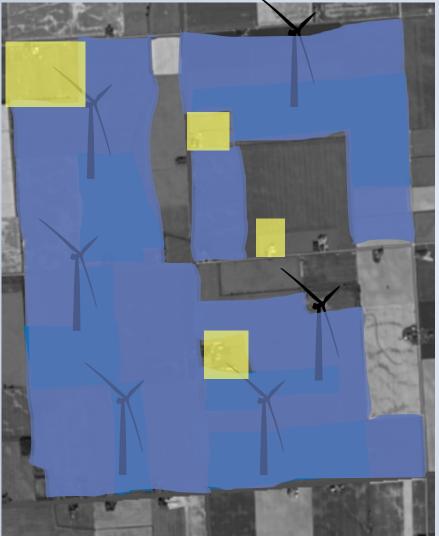
- All owners of land assessed ag
- 14 townships
 - 9 with windfarms
 - 5 without
- 1,210 responses (72% response rate)
- Funded by Dow Fellowship



Impacts of Wind Energy Local Benefits

- Landowner payments
 - Farm succession
 - Farm reinvestment
 - Not JUST farmers

Direct Benefits to Others



- Old Model: Winner takes all
 - o Disturbance
 - o Royalty
- Newer Model: Pooled Royalties

 Usually per-acre
- Newest Model: Includes Smaller Parcels
- Direct benefit to others depends on model





Impacts of Wind Energy Local Benefits

Landowner payments

- Tax payments to local government
 - Benefits counties, townships, fire services, libraries
 - Impact on schools depends

Impacts of Wind Energy Local Benefits

- Landowner payments
- Tax payments to local government
- Jobs (maybe)
 - During construction
 - Fewer long-term

- Landowner payments
- Tax payments to local government
- Jobs (maybe)

- Noise
 - Annoyance, not hearing loss
 - Attitudes split

- Landowner payments
- Tax payments to local government
- Jobs (maybe)

- Noise
- Human health
 - Annoyance, stress
 - Flicker

- Landowner payments
- Tax payments to local government
- Jobs (maybe)

- Noise
- Human health
- Property values
 - Perceptions: 54% say yes – linked to farm vs. non-farm
 - Studies: Nothing specific to Michigan; US studies say no

- Landowner payments
- Tax payments to local government
- Jobs (maybe)

- Noise
- Human health
- Property values
- Visual impacts
 - Day vs. night; technology to turn off red light
 - Attitudes split

- Landowner payments
- Tax payments to local government
- Jobs (maybe)

- Noise
- Human health
- Property values
- Visual impacts
- Wildlife
 - Environmental orgs encourage "right" siting

Summary of Wind Impacts Local Benefits Local Concerns

Landowner payments
 Noise

• Tax pay governr

Wind energy = Economic Development Opportunity

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cts.

Fits better in some communities than others

Jobs (maybe)

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





Impacts of solar energy on host communities

That's a much better option, right?





Comparative Impacts of Solar Energy

Local Benefits

- Landowner payments
 Fewer landowners, more \$
- Tax payments to local government
 - Probably, but not sure
- Jobs (maybe)
 Same

Local Concerns

- Noise
 Much less
- Human health
 n/a
- Property values
 - Concern, but few studies
- Visual impacts Concern, but easier to screen
 Wildlife
 - Primarily Construction

Impacts of Solar Energy

- Large land requirements
 - Developers looking for ~20 acres or ~600+ acres
- Good use of farmland?
 - Opportunity for pollinator habitat, improve water quality
 - What impact on rental land rates, farm economies?







Bottom Line on Solar

- Solar = economic development
- Where land is ample or of marginal quality, <u>no-brainer</u>
- Where ag-based economy, think more carefully through pros/cons





Why planning & zoning matter

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Step 1: Plan first!

- Land use planning helps communities set vision, navigate land use conflicts
- How does energy fit with your long-term plan?
 - For economic development
 - o For land use
- What sort of energy, and in which part of township?





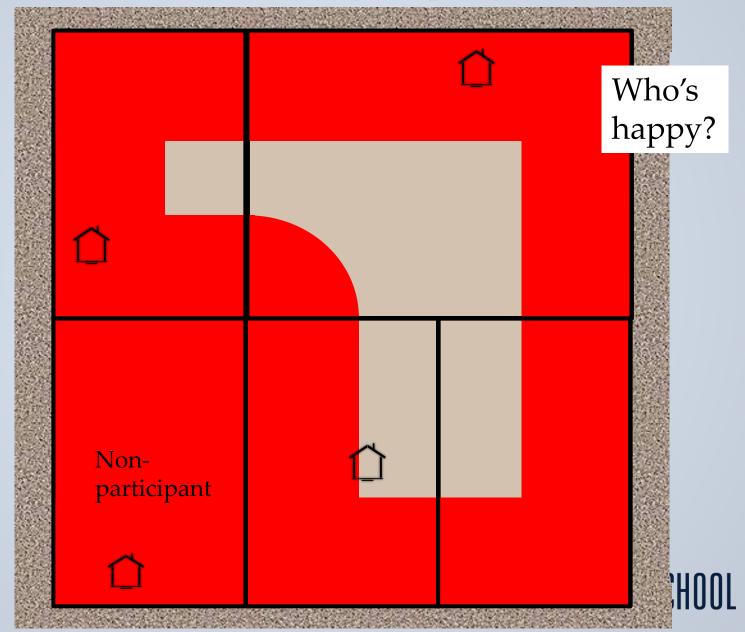
Step 2: Zoning should match the plan

- Zoning ordinances set rules to implement the plan
- Possible to create a legitimate zoning ordinance that minimizes or maximizes opportunities for turbines
 - Directs wind/solar development to particular areas
 - Provides/limits opportunities through setbacks, noise, other requirements
- Difficult / impossible to please everyone

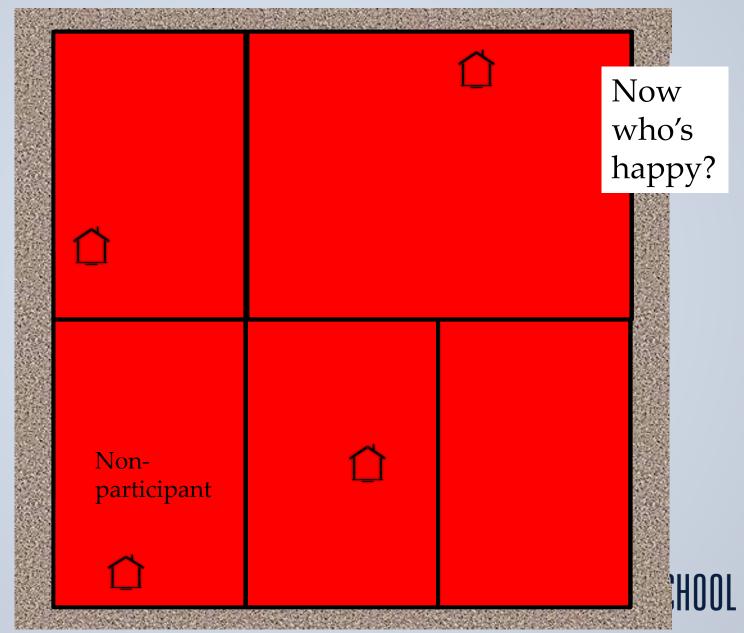




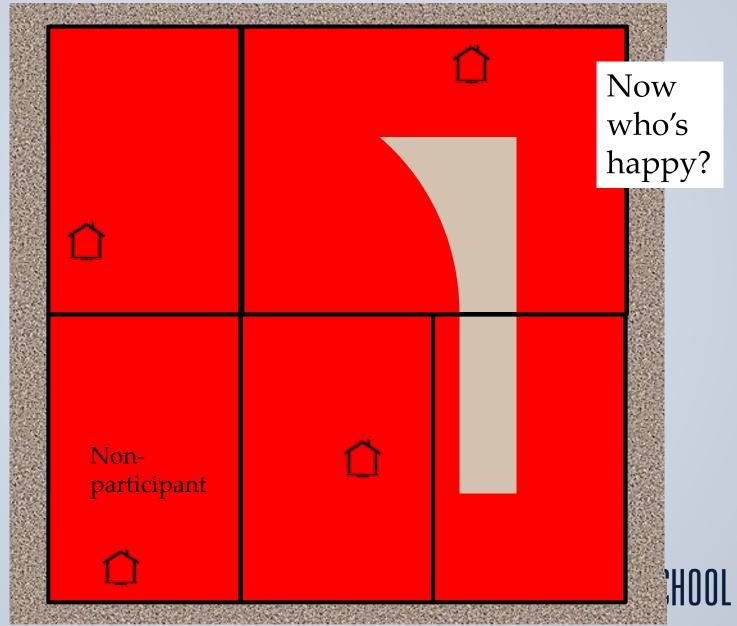
Example of Impact of Setback 1000' from road, non-participating



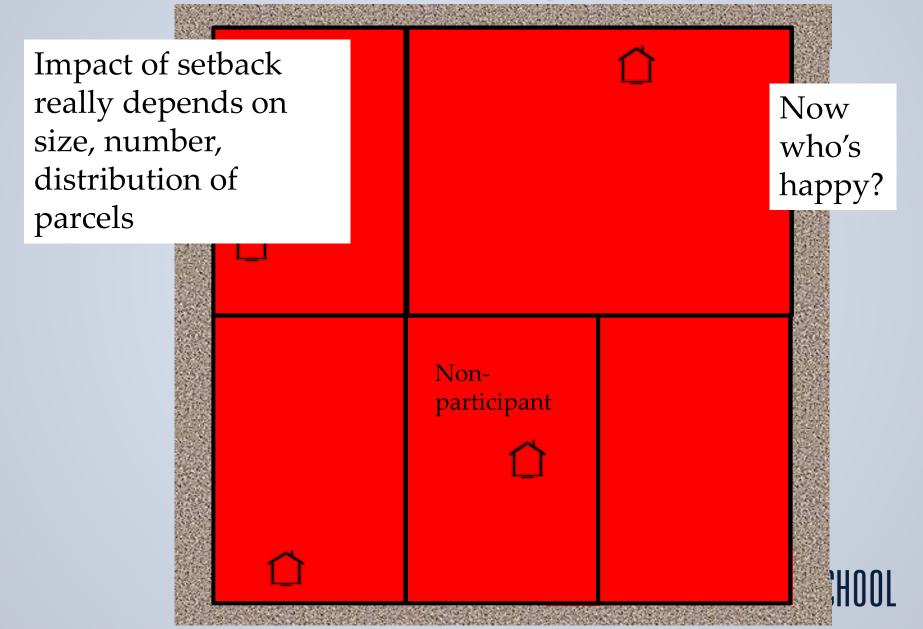
Double setback? 2000' from road, non-participating



Happy medium? 1000' from road, 2000' non-participating



Happy medium? 1000' from road, 2000' non-participating



Closing thought: Planning Process Critical to Public Acceptance



Photo: https://www.uppermichiganssource.com/content/news/Friends-of-the-Huron-Mountains-not-in-favor-of-wind-turbine-project-in-LAnse-489183491.html

 Need to talk it out;
 "what is our township/county's long-term vision?"

• Best before proposal is on the table

- o Time
- o Control
- o What's rational





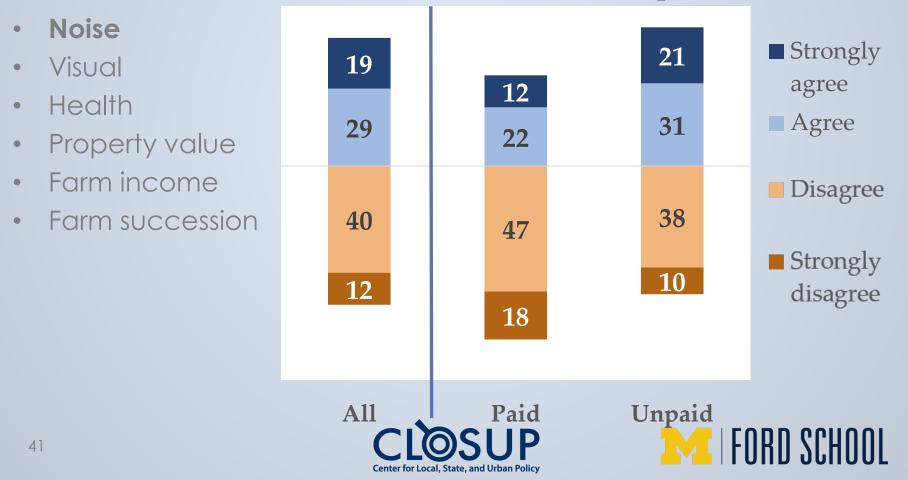
Thank you!

Questions?

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Individual-level Impacts

Turbines create noise pollution



Individual-level Impacts

Turbines create visual/aesthetic problems

