



## Annotated Solar and Wind Zoning Templates

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Following are annotated excerpts from two previously-published sample renewable energy zoning templates:

- [Planning & Zoning for Solar Energy Systems: A Guide for Michigan Local Governments](#)
- [Sample Zoning for Wind Energy Systems, 2020 edition](#)

These annotations are intended to help local governments understand how the provisions in PA 233 correspond to these common zoning provisions, and in particular to aid in their understanding of a Compatible Renewable Energy Ordinance (CREO).

A Compatible Renewable Energy Ordinance (CREO) is defined in PA 233 as one in which the requirements are “no more restrictive than the provisions included in section 226(8).”<sup>1</sup> The law also allows that renewable energy project applications submitted through a CREO process may include the requirements of section 225(1), including where details about commissioning plans are included.<sup>2</sup> While there is currently some dispute over whether a CREO may include any of the other provisions in PA 233 that apply to MPSC-approved projects, until that dispute is resolved, we have included only the most conservative interpretation of what a CREO may be. Thus, where a provision is not annotated, it is not included in sections 226(8) or 225(1).

For more information on the pros and cons of various zoning options in light of PA 233, check out resources available on [our website](#) or through EGLE’s [Renewable Energy Academy](#). You may also contact us via the email at: [sbmills@umich.edu](mailto:sbmills@umich.edu) (Sarah Mills) or [krol@umich.edu](mailto:krol@umich.edu) (Madeleine Krol).

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<sup>1</sup> PA 233, Section 221(f)

<sup>2</sup> PA 233, Section 223(3)(a)

## SPECIAL LAND-USE STANDARDS

Add to the Special Land Uses article of the ordinance, as a separate section, the following provisions for large principal-use SES. Also add 'large principal-use SES' to the list of special land uses in the zoning districts where appropriate. See discussion on the Rural-to-Urban Transect above.

### A. LARGE PRINCIPAL-USE SES: A large principal-use SES is a special land use in the zoning district specified and shall meet the following requirements:

1. **Height:** Total height for a large principal-use SES shall not exceed the maximum allowed height in the district in which the system is located [or a lesser height, such as \_\_ [e.g., 20] feet].
2. **Setbacks:** Setback distance shall be measured from the property line or road right-of-way to the closest point of the solar array at minimum tilt or any SES components and as follows:
  - a. In accordance with the setbacks for principal buildings or structures for the zoning district of the project site [or \_\_ [e.g. 50] feet from the property line of a non-participating lot].
  - b. \_\_ [e.g., 100] feet from any existing dwelling unit on a non-participating lot.
  - c. A Ground-Mounted SES is not subject to property line setbacks for common property lines of two or more participating lots, except road right-of-way setbacks shall apply.
3. **Fencing:** A large principal-use SES may [shall] be secured with perimeter fencing to restrict unauthorized access. If installed, perimeter fencing shall be a maximum of \_\_ [e.g. something greater than or equal to 7] feet in height. [Barbed wire is prohibited.] Fencing is not subject to setbacks.
4. **Screening/Landscaping:** A large principal-use SES shall follow the screening and/or landscaping standards for the zoning district of the project site. Any required screening and landscaping shall be placed outside the perimeter fencing.
  - a. In districts that call for screening or landscaping along rear or side property lines, these shall only be required where an adjoining non-participating lot has an existing residential or public use.

Lapeer Solar Park. Photo by Bradley Neumann.



- b. When current zoning district screening and landscaping standards are determined to be inadequate based on a legitimate community purpose consistent with local government planning documents, the Planning Commission may require substitute screening consisting of native deciduous trees planted \_\_\_ [e.g. 30] feet on center, and native evergreen trees planted \_\_\_ [e.g. 15] feet on center along existing non-participating residential uses.
- c. The Planning Commission may reduce or waive screening requirements provided that any such adjustment is in keeping with the intent of the Ordinance.
- d. Screening/landscaping detail shall be submitted as part of the site plan that identifies the type and extent of screening for a large principal-use SES, which may include plantings, strategic use of berms, and/or fencing.

**COMMENTARY:** Zoning requirements may impact the ability for the land to be returned to its original use. For example, required berming, substantial vegetative screening, or on-site stormwater detention/retention (which may be regulated by the Drain Commissioner, for example) may need to be removed or altered in order to return the land to its previous use. In considering whether to reduce, waive, or expand vegetation and screening standards, communities should take landowner considerations relating to reuse into account. [End of commentary]

5. **Ground Cover:** A large principal-use SES shall include the installation of ground cover vegetation maintained for the duration of operation until the site is decommissioned. The applicant shall include a ground cover vegetation establishment and management plan as part of the site plan. Vegetation establishment must include invasive plant species [and noxious weed, if local regulation applies] control. The following standards apply:
  - a. Sites bound by a Farmland Development Rights (PA 116) Agreement must follow the Michigan Department of Agriculture and Rural Development’s Policy for Allowing Commercial Solar Panel Development on PA 116 Lands.
  - b. Ground cover at sites not enrolled in PA 116 must meet one or more of the four types of Dual Use defined in this ordinance.
    - i. Pollinator Habitat: Solar sites designed to meet a score of 76 or more on the Michigan Pollinator Habitat Planning Scorecard for Solar Sites.
    - ii. 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).
    - iii. Forage: Solar sites that incorporate rotational livestock grazing and forage production as part of an overall vegetative maintenance plan.
    - iv. Agrivoltaics: Solar sites that combine raising crops for food, fiber, or fuel, and generating electricity within the project area to maximize land use. Project sites that are included in a brownfield plan adopted under the Brownfield Redevelopment Financing Act, PA 381 of 1996, as amended, that contain impervious surface at the time of construction or soils that cannot be disturbed, are exempt from ground cover requirements
  - c. Project sites that are included in a brownfield plan adopted under the Brownfield Redevelopment Financing Act, PA 381 of 1996, as amended, that contain impervious surface at the time of construction or soils that cannot be disturbed, are exempt from ground cover requirements.

**COMMENTARY:** The Michigan Department of Agriculture and Rural Development policy for allowing commercial solar energy development on PA 116 lands requires that any portion of the site not included in pollinator plantings must maintain U.S. Department of Agriculture, Natural Resources Conservation Service Conservation Cover Standard 327. Standard 327 reduces erosion, enhances wildlife, pollinator, and beneficial organism habitat, and improves soil health. Standard 327 can be implemented to support grazing animals with the right mix of forage crops. However, if grazing is the primary forage management practice, Prescribed Grazing Standard 528 may be a more useful standard to follow. Standard 528, however, does not apply to solar projects on land enrolled in PA 116 because the policy specifically recommends using Standard 327. There is flexibility within each standard to develop site-specific seed mixes. Private consultants as well as local NRCS staff can help develop a plan to implement these standards in a solar project. [End of commentary]

**COMMENTARY:** As discussed on Page 15, if a community's existing master plan and ordinance include farmland preservation provisions, it may make sense to extend them to large principal-use SES. In that case, signal your community's desire for development that minimizes impacts to locally important soil classifications through language such as:

**Agricultural Protection:** For sites where agriculture is a permitted use in a district, a large principal-use SES may be sited to minimize impacts to agricultural production through site design and accommodations including [select those most applicable to your community]:

- a. The ground mounting of panels by screw, piling, or a similar system that does not require a footing, concrete, or other permanent mounting in order to minimize soil compaction, [and/or]
- b. Siting panels to avoid disturbance and compaction of farmland by siting panels along field edges and in nonproduction areas to the maximum extent practicable and financially feasible, [and/or]
- c. Maintaining all drainage infrastructure on site, including drain tile and ditches, during the operation of the SES, [and/or]
- d. Siting the SES to avoid isolating areas of the farm operation such that they are no longer viable or efficient for agricultural production, including, but not limited to, restricting the movement of agricultural vehicles/equipment for planting, cultivation, and harvesting of crops, and creating negative impacts on support infrastructure such as irrigation systems or drains, or
- e. Voluntarily purchasing agricultural conservation easements from an equivalent number of prime farmland acres consistent with a purchase of development rights ordinance adopted under state law in \_\_\_\_ [local unit of government].

The above list is presented as a menu of sample standards and is neither a comprehensive list nor intended to be adopted in its entirety or verbatim. A local government that wishes to protect agricultural land from future development should work with a qualified planner and attorney to develop a comprehensive approach in the master plan and zoning ordinance that addresses threats to farmland from all types of development pressure. [End of commentary]



Aerial view of Tecumseh solar farm. Photo by Harvest Solar.

**MICHIGAN EXAMPLES:** Communities in Michigan have differing approaches to the compatibility of solar energy and agriculture. Here are some examples:

“Solar energy equipment shall only be located in an area determined to be “not prime farmland” by the U.S. Department of Agriculture (USDA), per the USDA’s Farmland Classification Map as of the date of Special Use Application for a Utility-Scale Solar Energy Collector System.”

– *Chester Township Zoning Ordinance (Ottawa Co.), Section 1912*

“All solar arrays greater than ten (10) acres in area must include one or more of the following amongst the panels of the solar array: Crop cultivation; Livestock grazing, with the panels raised to allow an eight (8) foot clearance for animals to pass underneath; or Pollinator fields, including milkweed and other native plantings.”

– *Grand Haven Charter Township Zoning Ordinance 2020 (Ottawa Co.), Section 3.03*

“Solar energy systems in Oliver Township are considered a compatible use in the Agricultural Preservation District. The siting of a ground mounted solar energy system is permitted in the Agricultural Preservation District (Chapter 5) and must conform to the front, rear, and side yard setback requirements described in Section 504.”

– *Oliver Township Zoning Ordinance (Huron Co.), Section 1305 [End of example]*

**COMMENTARY:** Some communities require a performance guarantee for small and large principal-use SES for the cost of grading and on-site ground cover establishment in the form of a bond, letter of credit, or establishment of an escrow account. The rationale is that if a site is cleared of vegetation and graded, but the project is not completed, there is a financial guarantee that the site will be stabilized. Such a provision may be redundant with Soil Erosion and Sedimentation Control (SESC) bonding requirements for projects larger than one acre, or for land enrolled in the Michigan Department of Agriculture of Rural Development's (MDARD) PA 116 Farmland and Open Space Preservation Program.

Regarding decommissioning guarantees, MDARD, as mentioned above, requires a surety bond or irrevocable letter of credit for solar development on PA 116 land to cover the cost of the removal of the solar facility and the restoration of the land to agricultural use. A community may wish to tailor the sample standard below based on this requirement by MDARD or provide an exception from the local government decommissioning guarantee for land enrolled in PA 116.

A periodic review (such as every 3-5 years) of the decommissioning guarantee will ensure adequate funds are available to cover decommissioning costs 20-30 years down the road. A review might also be triggered if there is a change of ownership. The ordinance should specify which body is responsible for approving the amount of the performance guarantee; the planning commission could recommend an amount, but the legislative body should make the final decision. When considering this language, a community could review how performance guarantees are handled for other types of developments, such as landscaping guarantees, and discuss how this could be the same or different. The amount of the guarantee for an SES may prompt a different level of review. [End of commentary]

6. **Lot Coverage:** A large principal-use SES shall not count towards the maximum lot coverage or impervious surface standards for the district.
7. **Land Clearing:** Land disturbance or clearing shall be limited to what is minimally necessary for the installation and operation of the system and to ensure sufficient all-season access to the solar resource given the topography of the land. Topsoil distributed during site preparation (grading) on the property shall be retained on site.
8. **Access Drives:** New access drives within the SES shall be designed to minimize the extent of soil disturbance, water runoff, and soil compaction on the premises. The use of geotextile fabrics and gravel placed on the surface of the existing soil for the construction of temporary drives during the construction of the SES is permitted, provided that the geotextile fabrics and gravel are removed once the SES is in operation.
9. **Wiring:** SES wiring (including communication lines) may be buried underground. Any above-ground wiring within the footprint of the SES shall not exceed the height of the solar array at maximum tilt.
10. **Lighting:** Large principal-use SES lighting shall be limited to inverter and/or substation locations only. Light fixtures shall have downlit shielding and be placed to keep light on-site and glare away from adjacent properties, bodies of water, and adjacent roadways. Flashing or intermittent lights are prohibited.
11. **Signage:** An area up to \_\_\_ square feet [should be consistent with the district or sign type standard] may be used for signage at the project site. Any signage shall meet the setback, illumination, and materials/construction requirements of the zoning district for the project site.
12. **Sound:** The sound pressure level of a large principal-use SES and all ancillary solar equipment shall not exceed \_\_ [e.g. 45] dBA (Leq (1-hour)) at the **property line** of an adjoining non-participating lot. The site plan shall include modeled sound isolines extending from the sound source to the property lines to demonstrate compliance with this standard.

- 13. Repowering:** In addition to repairing or replacing SES components to maintain the system, a large principal-use SES may at any time be repowered, without the need to apply for a new special land-use permit, by reconfiguring, renovating, or replacing the SES to increase the power rating within the existing project footprint.
- a. A proposal to change the project footprint of an existing SES shall be considered a new application, subject to the ordinance standards at the time of the request. [Expenses for legal services and other studies resulting from an application to modify an SES will be reimbursed to the \_\_\_\_ [local unit of government] by the SES owner in compliance with established escrow policy.]

**COMMENTARY:** A fundamental zoning concept is that a zoning ordinance must allow for nonconformities—that is, the continuation of a land use or structure that was legally established before a change in zoning that no longer permits the use or structure location. Zoning ordinances have standards for replacement, reconstruction, and expansion of nonconformities. For example, the decision could be centered around the replacement components’ monetary value—a new investment of 50% or more of the value of the project is a typical threshold for nonconformities. The zoning board of appeals or the planning commission, whichever is charged with making decisions on nonconformities, would decide the fate of the project based on the nonconforming standards in the ordinance, rather than following the original special land-use permit review process. A proposal to expand the footprint of the system could be at odds with ordinance rules for enlarging nonconformities. In that case, the ordinance may dictate that the proposal must be scaled back to meet the rules for replacing nonconformities, otherwise decommissioning may be the only option. If decommissioning is not the intended or desired outcome, a community has the option to amend the ordinance to allow for SES again, thereby releasing the project from nonconforming status. Communities should work with a municipal attorney to explore preferred options for the SES and how SES will be treated under an application to repower the system. [End of commentary]

- 14. Decommissioning:** A decommissioning plan is required at the time of application.
- a. The decommission plan shall include:
    - i. The anticipated manner in which the project will be decommissioned, including a description of which above-grade and below-grade improvements will be removed, retained (e.g. access drive, fencing), or restored for viable reuse of the property consistent with the zoning district,
    - ii. The projected decommissioning costs for removal of the SES (net of salvage value in current dollars) and soil stabilization, less the amount of the surety bond posted with the State of Michigan for decommissioning of panels installed on PA 116 lands,
    - iii. The method of ensuring that funds will be available for site decommissioning and stabilization (in the form of surety bond, irrevocable letter of credit, or cash deposit), and
  - b. A review of the amount of the performance guarantee based on inflation, salvage value, and current removal costs shall be completed every \_\_ [e.g., 3 or 5] years, for the life of the project, and approved by the \_\_\_\_\_ [legislative body] board. An SES owner may at any time:
    - i. Proceed with the decommissioning plan approved by the Zoning Administrator [or Planning Commission] under Section \_\_\_\_ [of local government ordinance] and remove the system as indicated in the most recent approved plan; or
    - ii. Amend the decommissioning plan with Zoning Administrator [or Planning Commission] approval and proceed according to the revised plan.
  - c. Decommissioning an SES must commence when the soil is dry to prevent soil compaction and must be complete within \_\_ [e.g., 18 months] after abandonment. An SES that has not produced electrical energy for \_\_ [e.g., 12] consecutive months shall prompt an abandonment hearing.

## Special Use Standards

Add a section to Article 16 (the part of the zoning ordinance for specific special use permits standards) to regulate utility-scale wind energy system (WES) which may include Anemometer Towers accessory to the proposed Utility-Scale WES.

### 1609 Utility-Scale WES (including permanent Anemometer Towers accessory to the project).

#### A. Setbacks:

1. An Anemometer Tower shall be setback a distance equal to \_\_\_\_ [for example: 1.1] times height from a property line or road right-of-way.
2. A wind turbine setback shall be measured from \_\_\_\_ [for example: the closest point of the base of the wind turbine to the [property line] or [inhabited structure]] and shall not exceed:
  - i. Road right of way: A horizontal distance equal to \_\_\_\_ [for example: 1.1 or 1.5] times the height or \_\_\_\_ feet [for example 500] from the edge of the road right-of-way, whichever is greater;
  - ii. Non-participating parcels: A horizontal distance equal to \_\_\_\_ [for example: 1,300 feet or 3 times height] from the \_\_\_\_ [property line] or [dwelling];
  - iii. Participating parcels: A horizontal distance equal to \_\_\_\_ [for example: 1,100 feet or 2.5 times height (something less than 2. ii above) from the [property line] or [dwelling];

#### Commentary:

**Setback to property line or dwelling:** Deciding whether setbacks are measured to a property line or a dwelling is a common issue when crafting a zoning ordinance for WES. Some communities use setbacks to dwellings or inhabited structures, others use setbacks to property lines, and some use a combination of both (See [Appendix A: Wind Turbine Noise](#) for more information on setbacks). When using both, there may be a setback to a dwelling for a participating parcel and a setback to a property line for a non-participating parcel. In Michigan, wind development has generally occurred in areas with around 2 to 2.5 times height or 1,000 to 1,250 foot setbacks to a dwelling or property line.

Geographic Information Systems (GIS) can be a helpful tool to model various setbacks from roads, property lines, dwellings, and natural features (lakes, rivers, natural areas). Seeing how setback distances change the viability or the density of a WES can help a Planning Commission determine a point at which a combination of setbacks would allow for, or potentially exclude, wind energy development.

**Participating and non-participating properties:** Property owners that enter into a lease or easement agreement with a wind energy developer are referred to here as participating properties. Those that were asked but declined, or those that were never approached, are non-participating. It is important to remember that not all properties that are impacted by a WES will have been approached about signing a lease or easement. This is certainly the case for properties lying just outside the boundaries of the wind development. With this in mind, some communities adopt separate standards for each type of property, with more restrictive standards applied to non-participating properties and that approach is used here ([Appendix A: Wind Turbine Noise](#), Table 1: Utility-Scale Wind Energy Zoning Regulation Comparison in Michigan). The purpose for doing so is to further minimize nuisance for those not receiving compensation from the wind energy development and create an incentive for developers to work with property owners in the vicinity of the project.



**Setback distances vary:** Setback distances vary among Michigan communities and other Midwestern states ([Appendix A: Wind Turbine Noise](#), Table 2: Comparison of Midwestern State Standards Regulating Wind Energy Development). Land use patterns and parcel sizes in the area can impact local regulation. In many parts of Europe where land use controls and patterns restrict residential development in rural areas, 500 meters (1,640 feet) to 1,000 meters (3,280 feet) for a setback is common<sup>66</sup>. The Canadian province of Ontario starts at a 550 meters (1,804 feet) and the setback increases with wind turbine sound power and the number of turbines within 3 kilometers (1.86 miles)<sup>67</sup>. In Michigan and nearby Midwestern states where a system of roads bordering one mile sections are common, the constraints on development are different. This is where the use of GIS can be helpful in Michigan to illustrate local opportunities or constraints.

**Setback to roads and other infrastructure:** In addition to setbacks to road right of way (ROW), some communities adopt setbacks to railroads, major gas lines, and electrical transmission lines, such as 1.1 times turbine/tower height. In the absence of these additional setbacks, the location of transmission lines and railroads should be shown on site plans and communication between the developer and major utilities/railways can be facilitated through the site plan review process. [End of commentary]

3. A Wind Turbine is not subject to property line setbacks for common property lines of two or more participating parcels, except road right-of-way setbacks shall apply.

B. **Height:** WES are not subject to height limitations found in Section \_\_\_\_ [this is the height standard applied to buildings and signs in the zoning district, such as a maximum of 30' or 40'].

**Commentary:** Modern utility scale wind turbines include a tower (90 to 110 meters) and blades (45 to 55 meters) for a total height of about 440 to 550 feet. Generally, wind turbines are getting taller and more powerful. Where a single turbine might have produced 1.4 megawatts (MW) in the early 2000s, a modern onshore wind turbine can produce 2.5 to 3 MW. Using this example, building a 100 MW wind farm two decades ago would require about 70 turbines. In 2020, 33 to 40 turbines would be needed to produce the same amount of energy. If a community limits turbine height to 200, 300, or even 400 feet, they may be excluding modern utility-scale wind development and/or creating an incentive to site more, smaller turbines. [End of commentary]

C. **Accessory Uses:** An Operations and Maintenance Office building, a sub-station, or ancillary equipment shall comply with property setback requirements of the respective zoning district. Overhead transmission lines and power poles shall comply with the setback and placement requirements applicable to public utilities.

D. **Laydown Area:** A centralized temporary laydown area for wind turbine component parts and other related equipment shall comply with property-setback requirements of the district and be detailed in the application.

E. **Sound Pressure Level:** The sound pressure level shall not exceed the following:

1. **Non-participating property:** Sound from a WES shall not exceed \_\_\_\_ dBA L<sub>1</sub> (\_\_\_\_-minute) measured at the \_\_\_\_ [dwelling] or [property line] of a non-participating property. If the average

<sup>66</sup>Summary of Wind Energy Policies by Country (2012) Minnesota Environmental Review of Energy Projects, Minnesota Department of Commerce, <https://mn.gov/eera/>

<sup>67</sup> Ontario Environmental and Energy. (n.d.). Chapter 3: Required setbacks for wind turbines. In *Technical Guide to Renewable Energy Approvals*. <https://www.ontario.ca/document/technical-guide-renewable-energy-approvals/required-setback-wind-turbines#>

background sound pressure level exceeds \_\_\_ dBA L<sub>1</sub> (1-minute) the standard shall be background sound dBA plus \_\_\_ [for example: 5 or 10] dBA.

2. **Participating property:** Sound from a WES shall not exceed \_\_\_ dBA L<sub>1</sub> (1-minute) measured at the \_\_\_ [dwelling] or [property line] of a participating property. If the average background sound pressure level exceeds \_\_\_ dBA L<sub>1</sub> (1-minute) the standard shall be background sound dBA plus \_\_\_ [for example: 5 or 10] dBA.

3. **Sound measurement methodology:** Sound pressure level measurements shall be performed by a third party, qualified professional selected by the developer and approved by the Planning Commission. Testing shall be performed according to the procedures in the most current version of ANSI S12.18 and ANSI S12.9 Part 3. All sound pressure levels shall be measured with a sound meter that meets or exceeds the most current version of ANSI S1.4 specifications for a Type II sound meter.

4. **Post-construction sound survey:** A post-construction sound survey shall commence within the first year of operation to document levels of sound emitted from wind turbines. The study will be designed to verify compliance with sound standards applicable to this ordinance. The WES owner shall provide SCADA data during the testing period to the sound consultant completing the study.

**Commentary:** Choosing a regulation and methodology for post-construction sound compliance testing should involve an acoustic consultant with a background in wind turbine noise compliance testing. The testing methodology should be related to the regulation and public purpose and be detailed enough that if two acousticians are tasked with compliance testing at the same location at the same time, they would end up with similar results. If the ordinance provides no detail on how the testing will be performed, the details will have to be negotiated at a later date. An acoustic consultant can provide details and recommendations on the most recent methodologies (such as using attended and unattended measurement), number of testing locations, times of day/night, and data needed to determine compliance. The detail required and necessary tailoring to the regulation precludes a full outline of compliance testing methodology here.

See Mason and Huron County's ordinances in the Michigan Zoning Database<sup>68</sup>. [End of commentary]

F. **Safety:** Utility-scale WES shall be designed to prevent unauthorized access to electrical and mechanical components and shall have access doors that are kept securely locked at all times when service personnel are not present. All spent lubricants and cooling fluids shall be properly and safely removed in a timely manner from the site of the WES. A sign shall be posted near the tower or Operations and Maintenance Office building that will contain emergency contact information. A sign shall be placed at the road access to a wind turbine to warn visitors about the potential danger of falling ice. The minimum vertical blade tip clearance from grade shall be \_\_\_ [for example: 20] feet for a WES employing a horizontal axis rotor.

G. **Construction Codes, Towers, and Interconnection Standards:** Utility-scale WES shall comply with all applicable state construction and electrical codes and local building permit requirements.

H. **Pre-Application Permits:** Utility-scale WES shall comply with applicable utility, Michigan Public Service Commission, Federal Energy Regulatory Commission interconnection standards, FAA requirements, and tall structures requirements, including but not limited to:

### 1. Aviation and Airport

<sup>68</sup> Michigan Department of Energy, Great Lakes, and Environment. (2019). *Michigan Zoning Database* (April 1, 2019) [Data set]. <https://www.michigan.gov/climateandenergy/0,4580,7-364--519951--,00.html>

- i. Federal Aviation Administration (FAA) requirements. The minimum FAA lighting standards shall not be exceeded. The lighting plan submitted to the FAA shall include an Aircraft Detection Lighting System (ADLS) for the utility-scale WES. The tower shaft shall not be illuminated unless required by the FAA.
- ii. Michigan Airport Zoning Act (Public Act 23 of 1950 as amended, MCL 259.431 *et seq.*).
- iii. Michigan Tall Structures Act (Public Act 259 of 1959 as amended, MCL 259.481 *et seq.*).
- iv. Local jurisdiction airport overlay zone regulations.

**Commentary:** For additional commentary on FAA standards and Aircraft Detection Lighting Systems (ADLS) see “FAA lighting” in [Appendix C: Shadow Flicker, FAA Lighting](#). [End of commentary.]

**2. Environment:** The application will demonstrate mitigation measures to minimize potential impacts on the natural environment including, but not limited to wetlands and other fragile ecosystems, historical and cultural sites, and antiquities, as identified in the Environmental Analysis. The application shall demonstrate compliance with:

- i. Michigan Natural Resources and Environmental Protection Act (Act 451 of 1994, MCL 324.101 *et seq.*) (including but not limited to: Part 31 Water Resources Protection (MCL 324.3101 *et seq.*),
- ii. Part 91 Soil Erosion and Sedimentation Control (MCL 324.9101 *et seq.*)
- iii. Part 301 Inland Lakes and Streams (MCL 324.30101 *et seq.*)
- iv. Part 303 Wetlands (MCL 324.30301 *et seq.*)
- v. Part 323 Shoreland Protection and Management (MCL 324.32301 *et seq.*)
- vi. Part 325 Great Lakes Submerged Lands (MCL 324.32501 *et seq.*)
- vii. Part 353 Sand Dunes Protection and Management (MCL 324.35301 *et seq.*)

**Commentary:** Environmental issues are complex. These guidelines identify areas that should be addressed in an Environmental Impact Assessment, but do not specify how the assessment should be conducted. Site specific issues should determine which issues are emphasized and studied in-depth in the assessment. There are a number of state and federal laws that may apply depending on the site. [End of commentary]

**3. Avian and Wildlife Impact:** Site plan and other documents and drawings shall provide mitigation measures to minimize potential impacts on avians and wildlife, as identified in the Avian and Wildlife Impact analysis.

- i. The application shall demonstrate consultation with the U.S. Fish and Wildlife Service’s Land-Based Wind Energy Guidelines.
- ii. Applicants must comply with applicable sections of the Federal Endangered Species Act and Michigan’s endangered species protection laws (NREPA, Act 451 of 1994, Part 365).
- iii. The applicant or the applicant’s impact assessment must show consultation with the U.S. Fish and Wildlife Service regarding federally listed species and the Michigan Department of Natural Resources for state listed species. Early coordination with state and federal agencies is recommended.

**Commentary:** Wind turbines do kill birds in some areas, but they are not a major contributor to bird mortality<sup>69</sup>. According to research published in 2015, an estimated 234,000 birds were killed annually in the US from wind turbines. This is below other causes of direct bird mortality, including communication towers (6.6 million), building collisions (599 million) and cats (2.4 billion).<sup>70</sup> This sample zoning requires an Avian and Wildlife Impact Analysis but does not specify how the analysis should be conducted. Site specific issues should determine which issues are emphasized in the analysis. To assist applicants to minimize, eliminate, or mitigate potential adverse impacts, the U.S. Fish and Wildlife Service has developed the Land-Based Wind Energy Guidelines (2012).<sup>71</sup> If the local government desires more structure to the analysis requirements, the Potential Impact Index developed by the U.S. Fish and Wildlife Service provides a framework for evaluating a project's impact on wildlife. [End of commentary]

- H. **Performance Security:** Performance security, pursuant to Section \_\_\_ of this Ordinance, shall be provided for the applicant to make repairs to public roads damaged by the construction of the WES. In lieu of a performance security agreement with \_\_\_ [County or Township], the applicant may enter into a road use agreement with the \_\_\_ County Road Commission to cover the costs of all road damage resulting from the construction of the WES.

**Commentary:** Many ordinances defer to the County Road Commission to enter into a separate road use agreement with the developer or project owner because public roadways in Michigan are under the jurisdiction of Michigan Department of Transportation or the County Road Commission. A road use agreement typically specifies a performance guarantee, detailed documentation/videos/photos of roadway condition before and after construction, road intersection modifications to accommodate the enlarged turning radius associated with turbine component transport, and more. The local Road Commission should provide feedback on this ordinance provision to help shape a regulation around performance guarantees for public road repairs. [End of commentary]

- I. **Utilities:** Electric transmission lines extending from a wind turbine to a sub-station should be placed underground to a minimum depth of \_\_\_ feet to allow for continued farming and existing land use operations in the vicinity of the WES, and to prevent avian collisions and electrocutions. All other above-ground lines, transformers, or conductors should comply with the Avian Power Line Interaction Committee (APLIC) published guidelines<sup>72</sup> to reduce avian mortality.
- J. **Visual Impact:** Utility-scale WES projects shall use tubular towers and all utility-scale WES in a project shall be finished in a single, non-reflective, matte finish, color approved by the Planning Commission. A project shall be constructed using WES components (tower, nacelle, blade) of similar design, size, operation, and appearance throughout the project. An area of \_\_\_ square feet or \_\_\_ [for example: 5] percent of the nacelle [on one or two sides] may be used for a sign, such as for turbine identification or other insignia. The applicant shall avoid state or federal scenic areas and significant visual resources listed in the local unit of government's Master Plan.

<sup>69</sup> Breining, Greg (2020) Power or Prairie? It doesn't have to be an either/or. *Living Bird*, Cornell Lab of Ornithology. 65.

<sup>70</sup> Loss, S., Will, T. & Marra, P. (2015). Direct Mortality of Birds from Anthropogenic Causes. *Annual Review of Ecology, Evolution and Systematics*, 46, 99-120.

<sup>71</sup> U.S. Fish and Wildlife Service. (2012). U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines. [https://www.fws.gov/ecological-services/es-library/pdfs/WEG\\_final.pdf](https://www.fws.gov/ecological-services/es-library/pdfs/WEG_final.pdf)

<sup>72</sup> Avian Power Line Interaction Committee & US Fish and Wildlife Service. (2005). Avian Protection Plan (APP) Guidelines. [https://www.aplic.org/uploads/files/2634/APPguidelines\\_final-draft\\_Aprl2005.pdf](https://www.aplic.org/uploads/files/2634/APPguidelines_final-draft_Aprl2005.pdf)

**Commentary:** These guidelines try to address visual impact issues by providing some design standards around color and finish and by limiting commercial advertising. Allowing for signage on a turbine is optional; the content of a small identification sign on a turbine (letters, numbers, logos, corporate insignia) cannot be dictated by the zoning ordinance and are protected by the 1<sup>st</sup> Amendment.<sup>73</sup> [End of commentary]

- K. **Shadow Flicker:** Shadow flicker shall not exceed \_\_\_\_ [for example: 30] hours per year and/or \_\_\_\_ [for example: 30] minutes per day measured to the exterior wall of a dwelling or other occupied building on a non-participating parcel. Mitigation measures to minimize or eliminate potential impacts from shadow flicker, as identified in the Shadow Flicker Impact Analysis for human-occupied structures, shall include, but not be limited to:
1. Change the proposed location of the wind energy tower; or
  2. The utility-scale WES shall be turned off by manufacturer approved automated system during the period of time an inhabited structure receives shadow flicker; or
  3. The utility-scale WES shall be turned off during flicker events after \_\_\_\_ hours/year of shadow flicker on an inhabited structure; or
  4. There is screening (forest, other building(s), topography, window treatments/blinds) which shields the inhabited structure from a direct line of sight to the rotors causing shadow flicker.

**Commentary:** See [Appendix C: Shadow Flicker, FAA Lighting](#) for more information on Shadow Flicker. [End of commentary]

- L. **Signal Interference:** No utility-scale WES shall be installed in any location where its proximity to existing fixed broadcast, retransmission, or reception antennae for radio, television, or wireless phone or other personal communication systems would produce interference with signal transmission or reception unless the applicant provides a replacement signal to the affected party that will restore reception to at least the level present before operation of the WES. No utility-scale WES shall be installed in any location within the line of sight of an existing microwave communications link where operation of the WES is likely to produce electromagnetic interference in the link's operation.

- M. **Decommissioning:** A planning commission approved decommissioning plan indicating 1) the anticipated life of the project, 2) the estimated decommissioning costs net of salvage value in current dollars, 3) the method of ensuring that funds will be available for decommissioning and restoration, 4) the anticipated manner in which the project will be decommissioned and the site restored, and 5) the review of the amount of the performance guarantee based on inflation and current removal costs to be completed every \_\_\_\_ [for example 3 or 5] years, for the life of the project, and approved by the \_\_\_\_\_ [legislative body] board.

**Commentary:** A periodic review of the amount required to remove the system (such as every 3 to 5 years) will ensure adequate funds are available to cover decommissioning costs 20 to 30 years down the road. A review might also be triggered by a change of ownership, for example. The ordinance should specify which body is responsible for approving the amount of the performance guarantee; the planning commission could recommend an amount with the legislative body making the final decision. A community could review how performance guarantees are handled for other types of developments, such as landscaping guarantees, and discuss how this could be similar or require a higher level of review. [End of commentary]

<sup>73</sup> *Reed, et al v. Town of Gilbert, AZ et al.*, 135 S. Ct. 2218, 576 U.S. \_\_\_\_ (2015)

- N. **Complaint Resolution:** A complaint resolution plan shall be presented to the planning commission and approved prior to approval of a special land use permit. The complaint resolution program will describe how the developer receives, responds, and resolves complaints that may arise from the operation of the WES. The complaint resolution plan shall include appropriate timelines for response and other detailed information (such as forms, and contact information). As a condition of filing a complaint, a landowner must allow the \_\_\_\_\_ staff or designated agents and WES owner or agents on the subject property for further investigation.
- O. **Annual Maintenance Review:** The WES shall be maintained and kept in a safe working condition. The WES owner shall certify on an annual basis that all turbines are operating under normal conditions. Non-operational turbines at the time of the annual review, shall be identified and provided an expected date to resolve the maintenance issue. A wind turbine generator that has not been operational for over 12 months shall be considered abandoned and a violation of the special land use permit.
- P. **End of Useful Life:** At the end of the useful life of the WES, the system owner:
1. Shall follow the decommissioning plan approved by the Planning Commission under Section \_\_\_\_\_ [from local government ordinance] and remove the system as indicated in the most recent approved plan; or,
  2. Amend the decommissioning plan with Planning Commission approval and proceed with P.1 above; or,
  3. The \_\_\_\_\_ [local unit of government] reserves the right to approve, deny, or modify an application to modify an existing WES at the end of useful life, in whole or in part, based on ordinance standards at the time of the request. Expenses for legal services and other studies resulting from an application to modify or repower a WES will be reimbursed to the \_\_\_\_\_ [local unit of government] by the WES owner in compliance with established escrow policy.

**Commentary:** There are many scenarios that could occur at the end of useful life of a WES, other than decommissioning and removal. In Minnesota, several projects<sup>74</sup> constructed in the late 1990s or early 2000s are being repowered with new wind turbines<sup>75</sup>. For the Jeffers Wind Energy Center Repower Project in Minnesota, 2.5 MW turbines are being replaced with a 2.2 MW turbines. There are no examples in Michigan, to date, of repowering or replacing an existing WES. During the initial special land use permit review, a municipal attorney could help to frame a process for a request to repower or modify the proposed WES at the end of useful life. [End of commentary]

<sup>74</sup> Minnesota Department of Commerce. (n.d.) *Wind Turbines, Open Projects*. Environmental Review of Energy Projects. Retrieved September 3, 2020 from <https://mn.gov/commerce/energyfacilities/#turbine>

<sup>75</sup> Minnesota Department of Commerce. (n.d.) *Jeffers Wind Repowering Project*. Environmental Review of Energy Projects. Retrieved September 3, 2020 from <https://mn.gov/eera/web/project/13517/>