

Commercial Solar Siting Guidance

Minnesota Department of Natural Resources

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Introduction

Minnesota Governor Mark Dayton signed into law an omnibus economic development bill in 2013 that included the Solar Energy Jobs Act (Act). A provision of the Act was the establishment of Minnesota Statutes, section 216B.1691, which requires large utility companies to generate 1.5 percent of their electricity from solar sources by 2020. The statute has generated an influx of proposed commercial solar projects throughout Minnesota. This document is intended to help commercial solar developers site projects in locations that minimize impacts to natural resources. For this document, “commercial solar” is defined as ground mounted photovoltaic solar systems that create electricity that is sold to other users. Additional guidance will be needed if other types of large scale commercial solar systems (e.g., concentrated solar) are proposed in Minnesota.

Large electric power generating plants 50 megawatts (MW) or greater need a Site Permit from the Public Utilities Commission (PUC), according to Minnesota Statutes, chapter 216E. Projects less than 50 MW typically need a Conditional Use Permit (CUP) from the Local Government Unit (LGU). Locally reviewed projects include Community Solar Gardens, which may generate up to 1 MW with a maximum of 5 projects co-located (5MW total). Community Solar Gardens are permitted at the county, township, or city level through local land use ordinances, which typically require a CUP. The Minnesota Department of Natural Resources (DNR) provides comments and guidance to the PUC and LGUs. A DNR permit for the taking of a threatened or endangered species, DNR License to Cross Public Lands and Waters, or a Public Waters Work Permit may be required for some projects.

Early Coordination

The DNR encourages all commercial solar developers to start the initial planning process by sending project information, including a cover page, map of project area, and Geographic Information System (GIS) shapefiles of the project boundary, directly to the DNR Regional Environmental Assessment Ecologist (REAE), Ecological and Water Resources Division. Transmission and collector lines, access roads, and temporary construction areas outside the project boundary should also be included with the information submitted. These same materials should be submitted to the Endangered Species Review Coordinator along with the Natural Heritage Information Data Request Form. Early coordination with the DNR benefits the solar industry by identifying potential issues for resolution early in the process. The DNR provides insight on where high value habitat is within a project area so the site proponent can consider this as they develop the project. Early coordination with the DNR REAE is especially important for Community Solar projects because project notification to the DNR is inconsistent due to the numerous LGUs involved with permitting. To avoid last minute issues, it is advisable to provide project information directly to the REAE during the preliminary planning phase of project

development. Please contact the DNR REAE if you have questions or need additional information about siting commercial solar projects. The DNR REAE's address, email, and phone numbers can be accessed on the DNR website at:

http://www.dnr.state.mn.us/eco/ereview/erp_regioncontacts.html. Further coordination should also occur with the United States Fish and Wildlife Service (USFWS) concerning federally-listed species, bald eagles, and conservation easements.

Identification of High Value Resources

Identification of high value resources early in the process allows the developer and the DNR to work together to avoid and minimize potential impacts. Potential impacts include effects to native prairie, wetlands, state-listed species, or other valuable resources. The DNR can provide a preliminary review concerning high value resources prior to the developer acquiring or leasing the site. The preliminary review will help developers pursue sites that will be easier to develop and permit due to proper siting that avoids natural resource impacts.

The DNR has identified the following high value resources that should be identified and considered during project development.

Rare Species and Native Plant Communities

Minnesota endangered species law (Minnesota Statutes, section 84.0895) and associated rules (Minnesota Rules, parts 6212.1800 to 6212.2300 and 6134) prohibit the taking of endangered or threatened species without a takings permit. "Taking" for animals includes pursuing, capturing, or killing; and for plants includes picking, digging, or destroying. Surveys for rare species may be required to determine if the proposed project would result in a taking. Project planning timelines should take into account that some species can only be surveyed at specific times of the year.

Issues concerning rare features should be identified and resolved early in the siting process. To receive information regarding rare features and species in the vicinity of the proposed project, the developer should submit a completed Natural Heritage Information System (NHIS) Data Request Form (http://files.dnr.state.mn.us/eco/nhnrp/nhis_data_request.pdf). The Natural Heritage Review will identify known occurrences of rare plants, animals, and native plant communities near the project boundary. Please note that some NHIS data is available as GIS shapefiles and can be downloaded at no cost from the Minnesota Geospatial Commons at <http://gisdata.mn.gov>. These include the following shapefiles: DNR Native Plant Communities, Calcareous Fens, and Minnesota Biological Survey (MBS) Sites of Biodiversity Significance. The DNR recommends avoidance of these significant natural areas and encourages the use of this data to identify areas within a project boundary that would not be appropriate for development. Please contact the Endangered Species Review Coordinator at 651-259-5109 for more information about the Natural Heritage Review process.

Native Prairie

Given the rarity of native prairies, and the potential for state-listed species and other Species in Greatest Conservation Need (SGCN) to occur within native prairie habitat, the DNR recommends avoidance of all native prairie remnants. If avoidance is not feasible, rare species surveys may be required and will need to be coordinated with the DNR Endangered Species Review Coordinator (651-259-5109). The USFWS should also be contacted for their recommendations regarding native prairie.

Native prairie is grassland that has never been plowed and contains plant species representative of prairie habitats. In the mid-1800s, eighteen million acres of prairie covered Minnesota. Since then, more than 99% of native prairie has been destroyed, and the 1% that remains consists mostly of widely scattered fragments that are surrounded by agriculture and development. Due to the loss of this once widespread habitat, many species found only in prairie have become rare; more than one-third of Minnesota's endangered, threatened, and special concern species are dependent on the remaining small fragments of prairie.

Project proposers are encouraged to use the data collected by the Minnesota Biological Survey (MBS) as an initial screen to identify known locations of native prairie. DNR Native Prairies are available as GIS shapefiles that can be downloaded at no cost from the Minnesota Geospatial Commons webpage at: <https://gisdata.mn.gov>. However, because this information is not based on a comprehensive inventory, there is the potential for native prairie to exist in the project area that is not included in these data sets. To better understand the potential impacts to native prairie and state-listed species, all grasslands or pasturelands within the project boundary that have not been previously plowed and that could be slated for development, including access roads and utilities, should be assessed by a qualified botanist or plant ecologist for the existence of remnant prairie. The DNR maintains a list of surveyors (available from the Endangered Species Review Coordinator) who are considered qualified to perform rare species surveys in Minnesota. Having a plant surveyor from this list perform the native prairie assessment will ensure that the surveyor will be able to obtain a collection permit if rare plant surveys are also needed. The DNR should be contacted to discuss potential surveyors, survey protocol, and other requirements before any work is initiated.

Wildlife Action Network, Minnesota Wildlife Action Plan

The Wildlife Action Network is composed of mapped terrestrial and aquatic habitats, buffers, and connectors that represent a diversity of quality habitats that support SGCN. SGCN are defined as native animals whose populations are rare, declining, or vulnerable to decline and are below levels desirable to ensure their long-term health and stability. Also included are species for which Minnesota has a stewardship responsibility.

The Wildlife Action Network is made up of mapped habitat representing viable or persistent populations and "richness hotspots" of SGCN. Added to this information are other data on the relative condition of habitat including spatially prioritized and connected Sites of Biodiversity Significance, Lakes of Biological Significance, and Streams with "exceptional" Indices of Biological Integrity. The network is largely based on ground-truthed mapped habitats that

represent a diversity of quality habitats that contain populations of SGCN. Consideration should be given to projects or activities that could result in the loss, degradation or fragmentation of habitat within the Wildlife Action Network. Habitat loss has been identified as a significant factor to SGCN population declines. The list of SGCN is available at: <http://www.dnr.state.mn.us/cwcs/index.html>. Detailed information concerning the richness hotspots and high value habitats that should be reviewed and considered during project development can be located on the DNR website.

Lakes, Wetlands, Streams and Rivers

Statewide and local government shoreland standards provide for the orderly development and protection of Minnesota's shoreland areas (lakes, wetlands, streams, and rivers). Local government floodplain standards promote public health, safety and general welfare, in accordance with state and federal regulations. The LGU should be contacted by the developer regarding local shoreland and floodplain ordinances and their application to a proposed solar development. Local floodplain ordinances would not allow solar structures and related infrastructure within the "floodway" portion of the floodplain.

If your project site is located within the Lower St. Croix Scenic Riverway or Mississippi River Corridor Critical Area then you should contact the LGU for requirements associated with these areas. Additional information on these areas can be viewed at the following websites: http://www.dnr.state.mn.us/waters/watermgmt_section/wild_scenic/wsivers/stcroix_lower.html and http://www.dnr.state.mn.us/waters/watermgmt_section/critical_area/index.html.

Project developers crossing (over, under, or across) any DNR administered state land or public water with any utility (power or transmission lines) need to apply for a DNR License to Cross Public Lands and Waters (Minnesota Statutes, section 84.415). Information and details on how to apply for a License to Cross can be found at: http://www.dnr.state.mn.us/permits/utility_crossing/index.html.

For detailed information on where public waters are located in a project area, visit the following web site and click on the Public Waters Inventory (PWI) Maps Download link: http://www.dnr.state.mn.us/waters/watermgmt_section/pwi/maps.html.

Minnesota Geospatial Commons (<https://gisdata.mn.gov/>) contains numerous GIS layers that can be downloaded and used to identify recreational areas including: State Lands Administered by the DNR or by counties; Scientific and Natural Area Units; Boundaries; Publicly Accessible State Wildlife Management Areas; State Forest Statutory Boundaries and Management Units; State Parks, Recreation Areas, and Waysides; State Trails of Minnesota; Public Water Access Sites in Minnesota; and State Aquatic Management Area Acquisitions.

Minnesota Statutes, section 103G.245, subdivision 1, indicates that a DNR Public Waters Work Permit is needed to change or diminish the course, current, or cross section of public waters by filling, excavating, or placing materials in or on the bed of public waters. Minnesota Rules, part 6115.0170, subpart 37 defines a structure as any building, footing, foundation, slab, roof, boathouse, deck, wall, dock, bridge, culvert, or any other object extending over or under, anchored

to, or attached to the bed or bank of a public water. A public water work permit is required for the placement of posts or other structures in public waters. Additional information concerning the public waters work permit process can be found at: <http://www.dnr.state.mn.us/permits/water/index.html>.

The Minnesota Wetland Conservation Act (WCA) regulates wetland draining and filling and essentially covers all wetlands that are not listed as public waters. The definition of “fill” under the WCA generally excludes posts and pilings or structures traditionally built on pilings. However, posts and pilings are regulated as fill if they bring the wetland into a nonaquatic use or have the effect of significantly altering the wetland’s function and value. To the extent that solar panels constructed on posts or pilings in a wetland will adversely affect wetland vegetation through shading or maintenance needs or impact wildlife, particularly bird use of wetlands, solar installations may be regulated under the WCA. As a regulated activity, such projects would be required to demonstrate that wetland impacts have been avoided and minimized to the extent practicable and to compensate for any unavoidable impacts by restoring or creating other wetlands or by purchasing banked wetland mitigation credits.

The DNR recommends that lakes, wetlands, streams, and floodplain be avoided in order to minimize project impacts. Avoiding these resources will reduce permitting costs and minimize damage to site infrastructure from flooding and ice damage.

The practice of surrounding natural wetlands with panels is not recommended as it will negatively impact wildlife use of the wetland. Some species will avoid the wetlands due to the structures, glare, vehicular traffic, and human disturbance.

Large Block Habitats

Large blocks of habitat (grassland or forest) can provide an increased diversity of species, higher species populations, and more resilient and complex ecological communities. A large block of habitat is a function of both acres and shape of the patch. Larger round or square blocks provide interior habitat that is more isolated from noise, pollution, parasitic birds, and predators associated with habitat edges. Locating solar projects in large blocks of forested or grassland habitat causes habitat loss and fragmentation that is detrimental to area-sensitive species. For example, habitat fragmentation is associated with decreases in population size and nesting success for area-sensitive species.

Large blocks (>40 acres) of grassland habitat in the project area should be identified. In many instances, blocks of grassland habitat will be in restored prairie, Conservation Reserve Program, Conservation Reserve Enhancement Program, or in conservation easements. The DNR recommends avoiding large blocks of grassland habitat during the solar siting process.

Forest interior habitat should be identified during project development. Forest interior habitat supports nesting and migratory stopover areas for area-sensitive species. Research suggests that area sensitive species tend to use forested areas at least 330 feet from the edge of the patch. The edge of the patch is where a break in the forest canopy occurs. Protecting interior habitat is important due to loss of this resource from habitat conversion for farming, transmission lines,

pipelines, roads, other forms of development, and potentially solar projects. Fragmenting forest interior can result in a loss of habitat for area-sensitive species. The deforested area and extended fragmentation effects result in less desirable plant communities, increased levels of invasive species, changes to avian and predator species composition and populations, nest parasitism, and behavior changes. The DNR recommends avoiding forest interior habitat during the solar siting process.

For both large blocks of grassland and forest habitat, it is also recommended that wildlife corridors, areas that provide a natural corridor for wildlife to travel between habitats, be preserved and avoided. Maintaining wildlife corridors benefits species diversity and reduces fragmentation effects on species.

Public Conservation and Recreation Lands

Public lands provide a multitude of recreational opportunities such as fishing, hunting, hiking, biking, bird watching, camping, boating, swimming, and educational opportunities. Public lands also provide a wide diversity of habitat that supports hundreds of species including birds, bats, amphibians, insects, and plants.

During early project planning, the developer should identify federal, state, and local government lands in and within 1/4 mile of the project area boundary using existing geographical information from the DNR, USFWS, and local governments. Minnesota Outdoor Recreation System Units (Minnesota Statutes, chapter 86A, Outdoor Recreation System) include state parks, state recreation areas, state trails, state scientific and natural areas, state wilderness areas, state forests, state wild & scenic rivers, state water access sites, state wildlife management areas, aquatic management areas, state historic sites, and other units should be identified. State water trail campsites, rest areas, and portages should also be identified even though they are not included in Minnesota Statutes, chapter 86A. Federal Waterfowl Production Areas and refuges, national parks, county trails and parks, other public lands, and private conservation lands should also be identified.

It is the DNR's responsibility to seek avoidance, minimization, and mitigation for potential impacts to Minnesota Outdoor Recreation System Units. In addition, the DNR recommends further avoidance in order to minimize indirect wildlife and recreational impacts. The DNR may provide additional recommendations concerning wildlife or recreational resources near DNR administered lands based on a project-by-project review. State, federal, and non-profit conservation groups have expended a considerable amount of time and money to acquire and manage these properties for the conservation of natural resources and recreational use by the public. Minnesota Geospatial Commons (<https://gisdata.mn.gov>) contains numerous GIS layers that can be downloaded and used to identify recreational areas including: State Lands Administered by the DNR or by counties; Scientific and Natural Area Units; Publicly Accessible State Wildlife Management Areas; State Forest Statutory Boundaries and Management Units; State Parks, Recreation Areas, and Waysides; State Trails of Minnesota; Public Water Access Sites in Minnesota; and State Aquatic Management Area Acquisitions.

Minnesota Rules, part 7850.4400, subpart 1 include a list of prohibited sites where no large electric power generating plant may be located. Large electric power generating plants are defined as

capable of operation at a capacity of 50 MW or greater (Minnesota Rules, part 4400.0200, subpart 10). The prohibited sites include: national parks; national historic sites and landmarks; national historic districts; national wildlife refuges; national monuments; national wild, scenic, and recreational rivers and their land use districts; state wild, scenic, and recreational rivers and their land use districts; state parks; nature conservancy preserves; state scientific and natural areas; and state and national wilderness areas.

Minnesota Rules, part 7850.4400, subpart 3 includes a list of site exclusions when alternative sites exist. No large electric power generating plant may be located in any of the following areas unless there is no feasible and prudent alternative. Economic considerations alone do not justify approval of these areas. The areas include: state registered historic sites; state historic districts; state wildlife management areas; county parks; metropolitan parks; designated state and federal recreational trails; designated trout streams; and the rivers identified in Minnesota Statutes, section 85.32, subdivision 1.

“School trust land” means land granted by the United States for use of schools within each township, swampland granted to the state, and internal improvement land that are reserved for permanent school fund purposes under the Minnesota Constitution, article XI, section 8, and land exchanged, purchased, or granted to the Permanent School Fund. Permanent university fund lands were granted to Minnesota by the United States for use and support of a state university. The DNR manages the trust lands for maximum long-term economic return under sound natural resource and conservation practices. Potential exists to locate solar projects on trust lands in order to generate income. For more information about school trust lands go to:

http://www.dnr.state.mn.us/aboutdnr/school_lands/index.html.

In general, developers should avoid DNR administered lands. Potential exceptions are trust lands and disturbed lands. Disturbed lands could include poorly reclaimed mine sites or other degraded areas. The DNR will review trust lands and disturbed lands on a project-by-project basis to determine if solar development is appropriate for the site. The DNR review will include identification of potential impacts to state-listed species, sites of biodiversity, wetlands, and other significant resources that may not be compatible with solar development. The value of mineral resources and other uses of the property will also be considered during the review.

Additional restrictions to development could also occur due to deed and funding restrictions that apply to certain parcels of DNR administered lands or to areas under easement.

Properties in Government Programs or with Conservation Easements

Solar projects are prohibited in Reinvest in Minnesota, DNR Native Prairie Bank, and Forest Legacy easements. The easement language prohibits the development of new structures within the area under easement. USFWS or private conservation easements may also have prohibitions on structures and should be reviewed with the holder of the easement. Statewide GIS (shapefiles) information on the location of Native Prairie Bank easements in relation to a project boundary can be requested from the Scientific and Natural Areas Program at:

<http://www.dnr.state.mn.us/prairierestoration/prairiebank.html>.

Design Considerations

Fencing

Fencing of a solar site has the potential to disrupt wildlife travel corridors. Project sites should be designed in a manner that does not disrupt significant wildlife travel corridors. Significant wildlife travel corridors are typically associated with streams, rivers, large wetlands, or other habitats. Fences can be modified to allow small openings for small animals to move in and out of the fenced area. Modified fencing for animal passage should only be used for specific sites on an as needed basis.

Fencing that will direct wildlife onto roads, especially high speed roads, should be avoided, as it results in wildlife fatalities and creates a safety issue for the motoring public. The DNR will provide comments during review of individual projects about when the use of fence setbacks from roads is warranted. The setback recommendation will be based on traffic volume and speed, as well as wildlife population levels in the area (primarily deer), and the presence of wildlife travel corridors.

The DNR recommends using 3-4 strand smooth fencing that is 4-5 feet high and does not use barbed wire. The use of a more open type of fencing allows wildlife to freely move in and out of the area. If chain link or woven wire fencing is used, then that fencing should be 8-10 feet high to ensure that deer do not attempt to jump the fence. Barbed wire should not be used at the top of the fence because deer can get entangled in the barbed wire. The result is injuries to the deer, fence repairs, and poor public relations for the operator of the solar project. An alternative design is to include a top guard angled out and upward at 45 degrees with 3-4 strands of smooth wire (no barbs) that would discourage trespassing. Solar developers should also review applicable codes and standards that may influence the type of fencing that is used at a site.

Wildlife Friendly Erosion Control

Fatalities to snakes, birds, small mammals, and other wildlife occur when they get entangled in erosion control mesh. The DNR recommends the use of biodegradable wildlife friendly erosion control materials for highly erodible areas. Biodegradable materials tend to break down faster than photodegradable materials, especially when the area is shaded. The netting should be flexible, rectangular shaped mesh (not square). The use of biodegradable mesh is most important in areas with state-listed species, and near wooded areas, wetlands, rivers, and lakes. Information on wildlife friendly erosion control can be found at:

<http://files.dnr.state.mn.us/eco/nongame/wildlife-friendly-erosion-control.pdf>.

Panels

A limited number of facilities in other states have reported that birds or insects mistake the glare or polarized light reflection as water. Sporadic fatalities may occur to birds attempting to land on or within the panels. A few species of insects have been documented to simultaneously lay eggs on panels resulting in reproductive failure. Impacts can be minimized by using less reflective panels, or non-polarizing white grids between the panels to break up the polarized reflection of

light. Another mechanism to reduce the potential for wildlife impacts is to place the panels away from water bodies. Solar developers should report any unusual wildlife events that occur on their site to the permitting authority and the DNR REAE. The monitoring information could then be used to determine if a pattern of impacts is occurring that should be addressed.

Vegetation Management

An opportunity is available to manage vegetation at project sites as short-grass prairie, meadows, or other appropriate wildlife habitat. The DNR encourages solar developers to plant native seed that contains grasses and flowering forbs that are beneficial to wildlife, including pollinators. For additional information on establishing and maintaining prairie to benefit pollinators and other insects go to the following link: http://www.dnr.state.mn.us/pollinator_resources/index.html. The planting of common milkweed (*Asclepias syriaca*) can be especially beneficial to monarch butterflies (*Danaus plexippus*) since their life cycle relies upon milkweed plants for egg laying and larvae development.

Establishing restored prairie on previously farmed land can provide the following conservation benefits: improved water quality by reducing soil erosion; increased soil water retention; improved soil composition and structure with the extensive root systems of prairie plants; reduced applications of fertilizer and herbicides; and habitat for pollinators and other wildlife.

The Minnesota Prairie Conservation Plan (Plan) provides a resource that promotes the conservation of grasslands, native prairie, and wetlands. The Plan identifies prairie core areas and corridors for connectivity. Avoiding impacts to these resources and establishing prairie at solar sites is a step toward supporting the intent of the Plan. After a solar site is decommissioned, the landowner should consider placing the established prairie into a permanent conservation easement or selling the land to a conservation organization. The Plan can be viewed at: <http://www.dnr.state.mn.us/prairieplan/index.html>.

Invasive Species Control

Vehicles and heavy equipment can gather and transport plants and soil that can spread invasive plant seeds from one work site to another. The DNR recommends all equipment be cleaned prior to transporting it to a new work site. Equipment cleaning will help prevent the spread of unwanted invasive plants that can become established, outcompete native vegetation, decrease habitat quality, and increase invasive/noxious weed control costs. Controlling invasive plants is especially important if the developer intends to seed the site to native grasses and forbs. Information on equipment cleaning to minimize the introduction and spread of invasive species is available online at:

http://files.dnr.state.mn.us/natural_resources/invasives/terrestrialplants/equipment_cleaning_to_minimize.pdf.

Equal Opportunity Statement

Equal opportunity to participate in and benefit from programs of the DNR is available to all individuals regardless of race, color, creed, religion, national origin, sex, marital status, public assistance status, age, sexual orientation, disability or activity on behalf of a local human rights commission. Discrimination inquiries should be sent to Minnesota DNR, 500 Lafayette Road, St. Paul, MN 55155-4049; or the Equal Opportunity Office, Department of the Interior, Washington, D.C. 20240.

Alternative format available upon request.

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