ENVIRONMENTAL ASSESSMENT

of

Badger Hollow Solar Farm LLC (an affiliate of Invenergy LLC)

Badger Hollow Solar Electric Generation Facility and Electric Tie Line Project

Dockets 9697-CE-100 and 9697-CE-101

Application for a Certificate of Public Convenience and Necessity of Badger Hollow Solar Farm LLC to Construct a Solar Electric Generation Facility and Electric Tie Line to connect the Facility to the Existing Transmission System, to be Located in Iowa County, Wisconsin

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Introduction

On June 5, 2018, Badger Hollow LLC (Badger Hollow), an affiliate of Invenergy LLC, filed an application with the of Public Service Commission of Wisconsin (Commission) to receive a Certificate of Public Convenience and Necessity (CPCN) for the authority to construct a solar electric generation facility (docket 9697-CE-100). On June 15, 2018, Badger Hollow filed an application to the Commission to receive a CPCN for the authority to construct an electric generator tie line to interconnect the solar facility to the existing transmission system (docket 9697-CE-101). The solar facility would have a nameplate capacity of 300 megawatts (MW) and the electric tie line would be a 138 kilovolt (kV) line. Badger Hollow would develop and construct the facilities, half of which (150 MW) is proposed to be purchased by Madison Gas and Electric Company (MGE) and Wisconsin Public Service Corporation (WPSC), the other half (150 MW) being proposed for future sale to an undetermined utility or purchase power agreement (PPA) partner.

Badger Hollow's request to receive a CPCN was filed with the Commission pursuant to Wis. Stat § 196.491 and Wis. Admin. Code § PSC 111. The application for the generating facility was determined to be complete on August 21, 2018.[1] The application for the tie line was determined to be complete on September 4, 2018.[1] Badger Hollow delivered copies of the complete applications[2] to the clerk of each municipality in which the project might be located and to the libraries in the wider project region by August 31 and September 14, 2018, for the respective applications.

Brief Description

The Badger Hollow solar generation facility would be a 300 MW alternating current (AC) photovoltaic (PV) electric generation site. The PV panels would be arranged in one or more "power blocks" that would be part of individual groupings called "subarrays," typically delimited by a fenced-in enclosure. Collector lines would go from these subarrays to a new collector substation. Here the voltage would be stepped up and the proposed 138 kV generator tie line would take the electricity to an expanded Eden Substation near Montfort, or a proposed "New Eden" Substation directly north of the generating facility, where it would interconnect to the existing electric grid. The land needed for the project would be leased from landowners. Badger Hollow would develop, construct, and operate the generation facility. In a separate docket before the Commission,[3] MGE and WPSC propose to purchase the Badger Hollow site, as well as an additional proposed solar electric generation facility in Kewaunee and Manitowoc Counties, Wisconsin. That solar facility is being proposed by Next Era Energy LLC and is being reviewed by the Commission under dockets 9696-CE-100 (generation site) and 9696-CE-101 (generator tie line).

[1] PSC REF#: 348976 (generation site), PSC REF#: 349672 (tie line)
[2] PSC REF#: 349485 (generation site), PSC REF#: 349995 (tie line)
[3] Docket 5-BS-228

Type II action under Wisconsin Environmental Policy Act (WEPA)

The generator tie line part of this project is a Type II action under Wis. Admin. Code § PSC 4.10(2). Type II projects require an environmental assessment (EA) to review potential impacts and determine if an environmental impact statement (EIS) is required. The solar generation site is a Type III action under Wis. Admin. Code § PSC 4.10(3). Type III actions normally do not require preparation of an EA or an EIS under Wis. Admin. Code § PSC 4.10(3). However, an evaluation of a specific Type III proposal may indicate that the preparation of an EA is warranted for that proposal. The Commission is preparing this EA to cover both the solar generation facility and tie line in one environmental review document.

An EIS is required if an EA determines there are significant impacts to the environment as a result of the project. The EA is a written review of the potential impacts of the proposed project that would affect the quality of the human environment as described in Wis. Stat. § 1.11(2)(c). The EA also describes ways of mitigating or avoiding some of the expected impacts and concludes with the evaluation of 10 items described in Wis. Admin. Code § PSC 4.10(2)(d).

Notification[4] of the Commission's intent to prepare an EA, including a solicitation for comments on the environmental aspects of this proposed project, was sent to the mailing lists for both dockets on September 27, 2018. The mailing list includes:

- Local residents and landowners potentially affected by the project;
- Municipal officials in the towns and counties covered by the project area;
- Local news media;
- Libraries in the project area;
- Senators and legislators representing the affected area, and;
- Any other persons with a demonstrated interest in the proposed project.

In addition to taking written comments on the proposed project, Commission staff held a scoping meeting in the project area on October 9, 2018. The scoping meeting was held in the project area at the Cobb Community Center, Cobb, Wisconsin. Commission staff were available to speak to the public about the proposed project, and take any comments or concerns regarding the environmental assessment or review of the project.

Environmental Assessment Scope

The Commission's Division of Energy Regulation prepared this EA in cooperation with the Department of Natural Resources (DNR) Office of Energy to determine if an EIS is necessary under Wis. Stat. § 1.11. A preliminary determination was made on December 12, 2018, concluding that preparation of an EIS was not necessary.[5] This preliminary determination was followed by a comment period ending January 7, 2019.

This EA is being submitted as an exhibit in the technical hearing on the proposed project. The scope of the EA is to review and describe the expected or potential impacts the construction and

[4] PSC REF#: 350788 (generation site), and PSC REF#: 350792 (tie line)
[5] PSC REF#: 355117 (generation site), and PSC REF#: 355120

operation of the proposed project would have on the environment. This includes impacts to the local residents and community as well as natural resources. The EA also addresses potential ways impacts could be avoided or mitigated. The analysis in the EA is provided to the public, intervenors, and the Commissioners to inform comments and decisions regarding the proposed project.

CPCN Hearing and Intervenors

The Commission issued a Notice of Proceeding for the docket on October 4, 2018,[6] indicating that a hearing would eventually be held on the proposed project.

The Commission issued a Notice of Hearing on December 7, 2018. The public hearing on the project is scheduled to be held in the project area at the Human Services Center, 303 West Chapel Street, Dodgeville, Wisconsin on January 24, 2019. The technical hearing for parties to the proceeding will be held on January 16, 2018, in the PSC Hearing Room (S105) at the State Hill Farms Building, 4822 Madison Yards Way, Madison, Wisconsin.

A Prehearing Conference was held at the Commission to discuss intervention, issues, schedules and other matters that would facilitate the hearing process. The following entities requested to intervene in the dockets and were accepted:

- Citizens Utility Board (CUB)
- RENEW Wisconsin
- Wisconsin Industrial Energy Group (WIEG)
- American Transmission Company LLC (ATC)
- Dairyland Power Cooperative (DPC)
- ITC Midwest LLC
- Clean Wisconsin
- Casey and Brenda Kite
- Jinkins, Jewell, and Wendhausen

Project Description

Badger Hollow Solar Farm LLC submitted an application to the Commission to obtain a CPCN authorizing the construction of a 300 MW solar electric generation facility under docket 9697-CE-100. Badger Hollow also submitted an application to construct a 138 kV tie line that would connect the solar facility with the existing transmission grid at either an expanded existing Eden substation or a proposed "New Eden" substation under docket 9697-CE-101. This environmental assessment reviews both projects proposed under these two dockets.

The solar facility would consist of solar PV panels on a single-axis tracking system. The project is planned to have a generation capacity of 408 MW direct current (DC) and interconnect at 300 MW AC. Solar panels are grouped into arrangements called "power blocks" of a certain size (e.g. 3 MW) connected to inverters sized to match the power generated by the power block. The inverters convert the DC power produced by the solar panels into AC that can go into

[6] PSC REF#: 351185 (generator site), PSC REF#: 351180 (tie line)

collector circuits and eventually the transmission system. Collector circuits would be constructed underground in trenches approximately 4 feet deep by 1 foot wide. The collector circuits would connect to a collection substation where the voltage would be converted from 34.5 kV to 138 kV. The electricity would then go into the proposed 138 kV generator tie line, which would connect the facility to the existing transmission system.

The 138 kV line could be constructed along sections potentially containing both new right-of-way (ROW) and existing ROW segments, and Badger Hollow has acquired the easements necessary for construction along the proposed routes. A range of structures could be used, including single-circuit, double-circuit, or triple-circuit monopole designs, depending on engineering or site requirements and outcomes of ongoing studies. Transmission structure material would likely be weathered steel, but would depend on final design requirements to be established in the future. Tangent pole structures would use a delta configuration for their arms. Poles would have a typical height between 70 and 85 feet above ground. The 138 kV line could proceed from the project substation either approximately 5 to 6 miles northwest to the existing Eden Substation or approximately 5 to 6 miles north to the "New Eden" Substation, depending on the route selected. The details of the transmission or interconnection facility upgrades required for the solar generation facility to be operational are dependent on the Midcontinent Independent System Operator, Inc.'s (MISO) August 2017 Definitive Planning Phase (DPP) Study Cycle. The results of this analysis are due in May 2019.

Approximately 2,700 acres make up the area affected by the proposed solar panel subarrays, electrical collection system, and access roads.[7] The solar subarrays would be fenced and seeded with low growing vegetation that would not shade the solar panels.

Project Purpose and Need

Badger Hollow submitted applications under Wis. Stat. §§ 196.025 and 196.491 and Wis. Admin. Code chs. PSC 4 and 111 to construct a 300 MW solar photovoltaic generation facility with associated facilities such as substation and collection lines as well as a 138 kV generator tie line to connect to the existing transmission grid. The purpose of the two dockets (referred together as "the project") is to generate utility-scale solar electricity. As Badger Hollow is a developer of a wholesale merchant plant, it is exempt from the needs analysis that would be required of a state public utility.

MGE and WPSC propose to purchase the project, which is being reviewed under docket 5-BS-228. Badger Hollow proposes to develop, construct, and operate the project.

Project Location

The project would be constructed in the towns of Mifflin, Eden, and Linden in Iowa County, with one possible tie line route extending west into the town of Wingville in Grant County. The project area is primarily made up of agricultural fields located near the villages of Cobb and Montfort in Iowa County. The overall acreage for the proposed project area is approximately 10,700 acres. This project includes all of the proposed solar panel sites, all transmission line

[7] PSC REF#: 353213

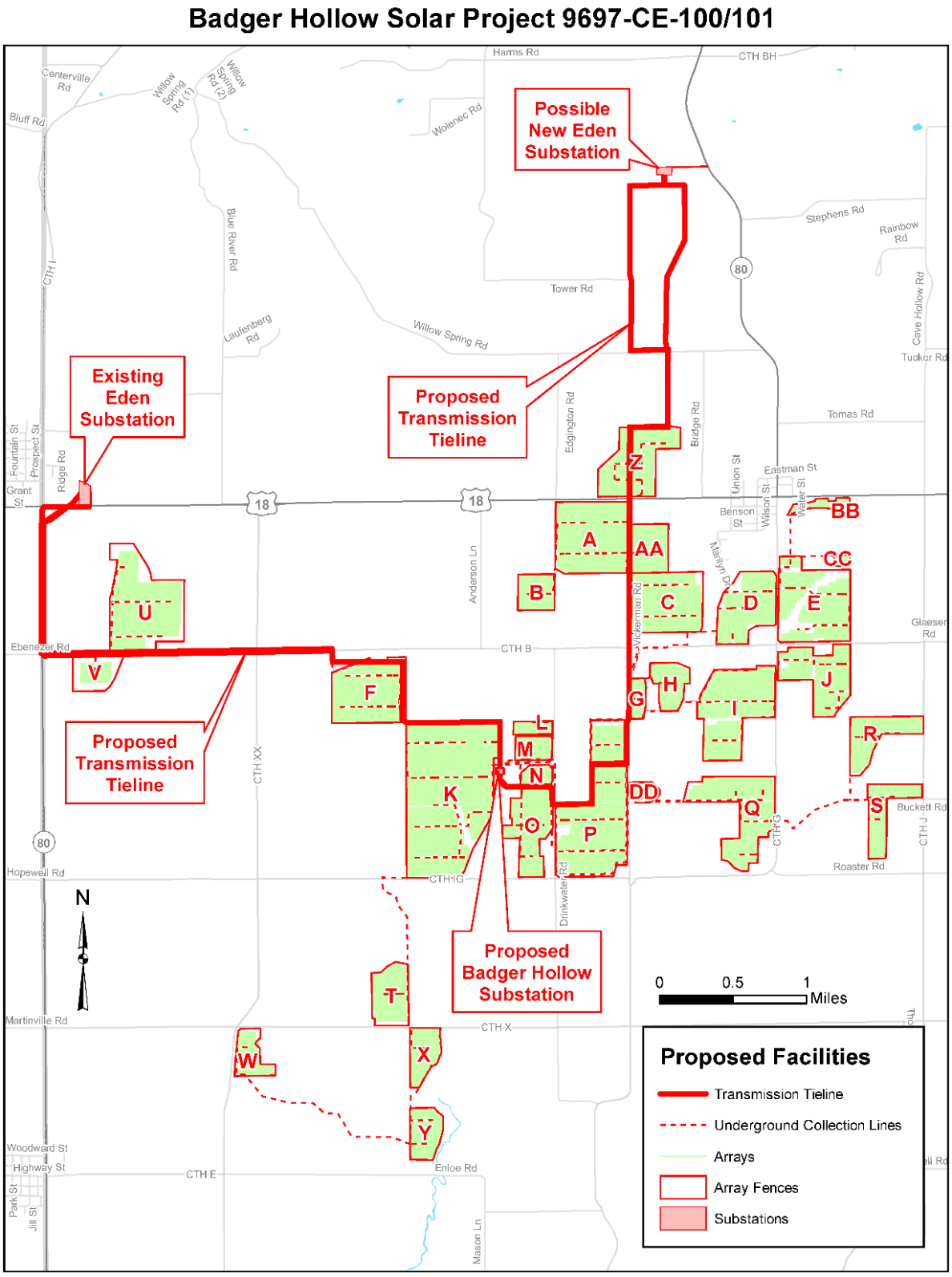
alternative routes, project collector substation, operations and maintenance building, and the two possible interconnection substations. The solar subarrays would be constructed on almost 2,700 leased acres. Figure 1 on the following page shows the entire project area for both the generation site and tie line facilities.

Subarray sites are located on primarily agricultural land. Several houses are located along the edges of the subarray sites, with some houses on County Trunk Highway (CTH) B and Drinkwater Road located between separate sections of solar subarrays.

The proposed solar subarray locations are between State Highway (STH) 80 to the west and CTH J to the east. The locations of proposed solar subarrays are south of Willow Springs Road and north of CTH E.

The proposed tie line route alternatives are located primarily in Iowa County, within Eden and Mifflin townships. One route option crosses the Iowa County line into the eastern edge of Grant County in Wingville township, along the STH 80 ROW. The tie line would connect the solar farm project to the ATC transmission system at a new interconnection substation positioned either along the Wyoming Valley to Eden ATC 138 kV transmission circuit north of the town of Cobb (New Eden interconnection), or at the existing Eden substation in Montfort.

Figure 1 **Map of the Badger Hollow Solar Project area**



Siting Process

Badger Hollow evaluated a range of variables to arrive at the selection of the proposed site facilities. The application provides details of this selection process in Section 1.4.2.[8] The application describes the method by which Badger Hollow analyzed the entire state of Wisconsin to site a solar facility and arrived at the current location. It describes a three-tiered evaluation; state level, regional level, and project area level. At the regional level, the potential use of brownfield sites was evaluated. A list of brownfield sites was accessed from the U.S. Environmental Protection Agency (EPA) website, and 113 properties were identified in the approximately 9,250 square mile area of southwest Wisconsin. Through that analysis, Badger Hollow determined that none of the brownfield sites would be suitable due to insufficient acreages.

After arriving at the project area level analysis, the list of the site variables and characteristics evaluated consists of:

- Existing transmission resources
- Land ownership and usage
- Topography project area
- Natural resources and endangered species
- Historic and cultural resources
- Project engineering and design work
- Municipality and landowner feedback

Developers evaluate different points of interconnection to the existing transmission system and look for locations that have existing transmission capacity with existing infrastructure. Siting a solar PV facility near these points on the transmission system reduces the amount of new infrastructure needed. Badger Hollow determined that the existence of the Eden Substation, with a confluence of transmission resources, provides a suitable area for the proposed project. Ongoing studies by MISO would help with final siting for the possible interconnection, including the need for an expansion to the existing Eden Substation or a newly constructed "New Eden" Substation.

Solar PV generation sites benefit from areas with flat topography and minimal grading requirements. Avoiding areas that would cast shade onto the PV panels is another suitability factor. Large agricultural fields that are not surrounded by large forests or tall buildings are often considered preferred sites. Siting reviews also attempt to avoid impacts to natural resources such as wetlands, waterways, rare species, and historic resources to the greatest extent possible. As a developer of a wholesale merchant plant, Badger Hollow would not have the ability to use eminent domain to acquire property for the construction of the generation site or associated facilities, so there needs to be local support for the project from landowners in order to obtain parcels that allow for the construction of subarrays in efficient layouts.

[8] PSC REF#: 349485, pages 8-12

As the Badger Hollow project is a merchant plant, the Commission may not consider economic factors when evaluating its proposal. A meaningful comparison of alternate project locations is not possible without the ability to consider costs and economic factors. As a result, discussion of alternative sites in this EA, other than the larger project siting process described in this section, focuses primarily on how the Commission may choose among the proposed panel locations within the Badger Hollow project footprint.

Wisconsin Stat. § 1.12(6) directs the Commission to consider corridor sharing opportunities when reviewing transmission facility projects. The statute states that, when siting new electric transmission lines, it is the policy of the state to attempt to share existing corridors to the greatest extent feasible. Corridors to be considered for sharing are prioritized in the following order:

- Existing utility corridors
- Highway and railway corridors
- Recreational trails, to the extent that the facilities may be constructed below ground and that the facilities do not significantly impact environmentally sensitive areas
- New corridors

However, when selecting corridors to share, the Commission must also determine that the corridor sharing is consistent with economic and engineering considerations, electric system reliability, and environmental protection.

Badger Hollow described their siting process evaluation of the proposed solar subarray sites. The proximity to the existing transmission grid, relatively level and open fields, physical proximity to the Montfort Wind Energy Center developed by NextEra Energy Resources, and the perceived acceptance of renewable energy technologies by some area landowners all influenced the selection of the project area. The ability to construct larger, more efficient subarray shapes led to the proposed subarray sites.

Badger Hollow considered the statutory requirements for siting the generator tie line, as well as criteria that would reduce impacts to environmental resources. Badger Hollow was able to get enough landowner agreements and leases to develop the solar generation layout and four route options for the generator tie line. Further discussion on project alternatives, including how the Commission can decide among the proposed subarray locations, are discussed later in this EA.

Utility-Scale Solar Generation

While the public has become used to seeing solar panels mounted on building roofs or in small groups on the landscape, the scale of utility-scale solar generation sites is relatively new to Wisconsin. This section of the EA provides a brief description of how solar PV technology works as it generates electricity. At this time, there are no proposals to use other solar electric generating technology, such as concentrating solar, for utility-scale electric generation facilities in Wisconsin.

Generation of Electricity

Solar PV technology can be used to convert sunlight into electrical energy. A single PV device is called a solar PV cell. These are made of semiconductor material, often silicon, in very thin layers protected by other materials such as glass, plastic, or metal. When incoming light hits this semiconductor material, the energy from the light can excite electrons, which flow in the form of an electrical current. This flow of electrons is electrical current, which flows out of the semiconductors to metal contacts that allow the current to travel down connecting wires and eventually to the electrical grid.

The semiconductor materials used in solar cells have an atomic network with atoms spaced at regular intervals and following a repeating pattern known as the lattice structure. This lattice structure helps to make conversion of light to electricity more efficient. The three commonly used types of PV panels are monocrystalline, polycrystalline, and thin-film panels.

Monocrystalline silicon will typically have higher efficiency, but cost more because the entire cell is carefully prepared from one silicon ingot. Polycrystalline silicon is typically less costly due to the less stringent manufacturing constraints, but also less efficient at converting energy due to lower material purity. In either case, an atomic network known as a lattice will be formed of the chosen materials, with atoms spaced at regular intervals and following a repeating pattern. Other semiconductor materials such as cadmium telluride and copper indium gallium selenide are also used to make thin-film solar cells.

At this time, crystalline silicon cells are more efficient than thin-film cells, although thin-film cells are likely to be cheaper than crystalline. This technology is continuing to change and improve in efficiency or cost, and this may affect the choice of panels in the future and provide options of using battery storage in conjunction with solar panels.

When the solar radiation hits these semiconductor materials, it generates the movement of electrons through the material. Incoming light possesses energy that can excite electrons in atoms to a state where they are ejected from the atom, which serves as the basis for the electrical current flow created by solar panels. This effect, known as the photoelectric effect, which Albert Einstein explained in the early 1900s, serves as one foundation for quantum mechanical principles. This flow of electrons is electrical current, which flows out of the semiconductors to metal contacts that allow the current to travel down connecting wires and eventually to the electrical grid.

The method used to mount PV panels to poles or supports affects the efficiency of solar electric generation facilities. Panels mounted in a fixed position can only absorb sunlight that falls on them. The amount of sunlight is dependent upon local weather conditions (cloudiness, rain, fog, snow), as well as the time of year. Many newer solar facilities use single-axis or dual-axis tracking systems to move the panels to follow the sun. Single-axis tracking systems, proposed for use in Wisconsin allow the panels to rotate from east to west to follow the sun. This tracking increases the energy produced by the panels compared to fixed-mount systems. Dual-axis tracking systems can be even more accurate in tilting to face the sun where it rises and sets throughout the year, as well as its travel from east to west each day. However, despite their

potential increase in sunlight absorption, dual-tracking systems also have increases in costs and maintenance requirements that often are not made up for in the increased electricity generation.

In larger solar array projects, shading considerations must be made to offset potential losses that can occur from either neighboring rows of solar panels or other obstructions (e.g. trees, houses). Sometimes, a concept known as "backtracking", which is an algorithm that fine-tunes the panel position, is used to lessen the shading effects from one row of panels to another. This reduces electricity production losses, even if the solar panels are not always directly facing the sun. Shading losses are most problematic when the sun is low in the sky, such as early in the morning and later in the afternoon. Consequently, these times generally also correspond to lower solar energy production. Other factors that can cause less efficient solar energy production include dirt or snow covering the panels, high panel temperatures, and gradual degradation of the panel efficiency as the panels age. Currently, most manufactured panels have an expected lifetime of 20 to 30 years.

In addition to the panels, a solar energy generation facility needs inverters to convert the DC electricity generated by the PV cells into AC electricity that can be used in the electrical grid. To accomplish this, a number of panels are linked into a group called a string or power block, and these are connected to an inverter. Site designers generally try to optimize the ratio of a grouping of panels and inverters to be as efficient as possible, within the restrictions of local geography or regulatory requirements. Badger Hollow describes the ideal power block arrangement that would involve a roughly rectangular grouping of panels that would be attached to a 3 MW inverter.9 The power blocks would be developed to have a uniform size of about 3 MW, although a final engineering determination would be made at a later time. Badger Hollow indicated that power blocks developed for inverter sizes from 2.5 to 4.5 MW could be instituted, though 3 MW is the current design size.[10]

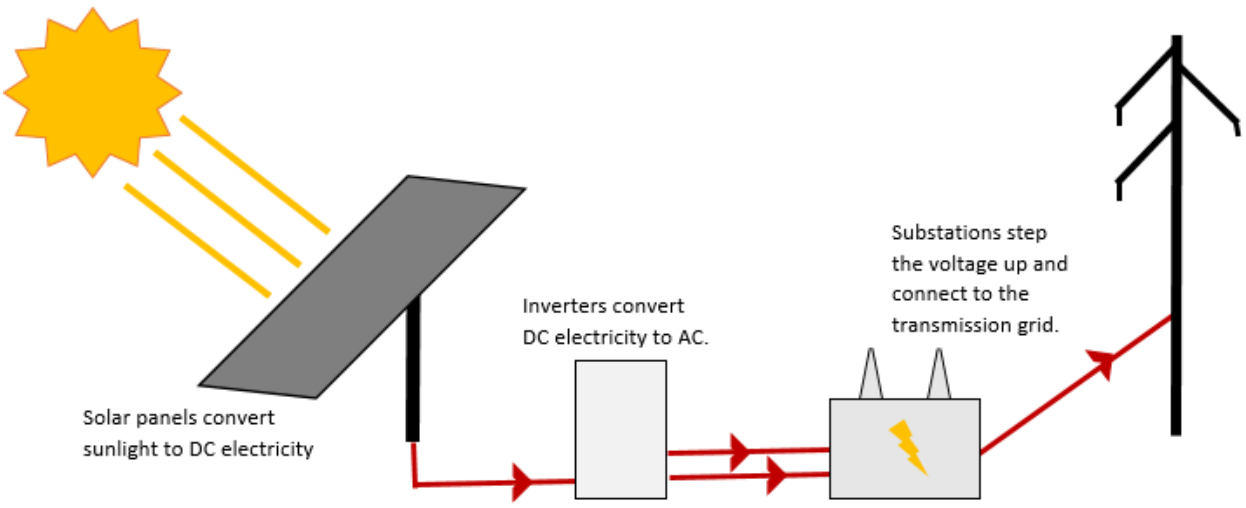
Inverters for large solar arrays can produce sound when they are in operation. As the distance increases, the noise level goes down. Since solar panels produce power only when the sun is shining, inverters would likely be silent at night when no power is produced and the inverters are not operating.

Transmission of Electricity

Once electricity is converted at the inverter, it is gathered together in collection circuits, which take it to a project substation. The substation increases the electrical voltage with a transformer in order to allow it to be transmitted over the main electric grid.

[9] PSC REF#: 349485, page 10
[10] PSC REF#: 349485, page 7

Figure 2 An example of how solar energy turns into electric power on a utility grid



Power plants generate three-phase alternating current, therefore a transmission line is constructed with three wires, one for each phase. On a transmission structure, the three large wires are called conductors and carry the electric power. Badger Hollow expects to use a bundled 636 ACSR Grosbeak[11] conductor for the project, with an outer diameter of the bundled conductors of approximately one inch and an ampacity of 789 amperes, though that is subject to change based on final engineering design work. There is also a smaller wire at the top of the structure, called a shield wire. The shield wire is designed to protect the power line from lightning and may also contain fiber optic communication cables. Electric lines with two sets of three conductors are referred to as double-circuited structures, while those with three sets of conductors are triple circuited. If the Pink Route alternative is selected, it may be that approximately 60 percent of the total length of the route would require double- or triple-circuit configuration and be co-located with existing ATC circuits that occur along CTH B and STH 80, or the ATC 69 kV Eden to Rewey transmission line.[12] Transmission structures can be constructed of metal or wood and can be single-poled or multi-poled, though weathered steel is the most likely selection at this time.

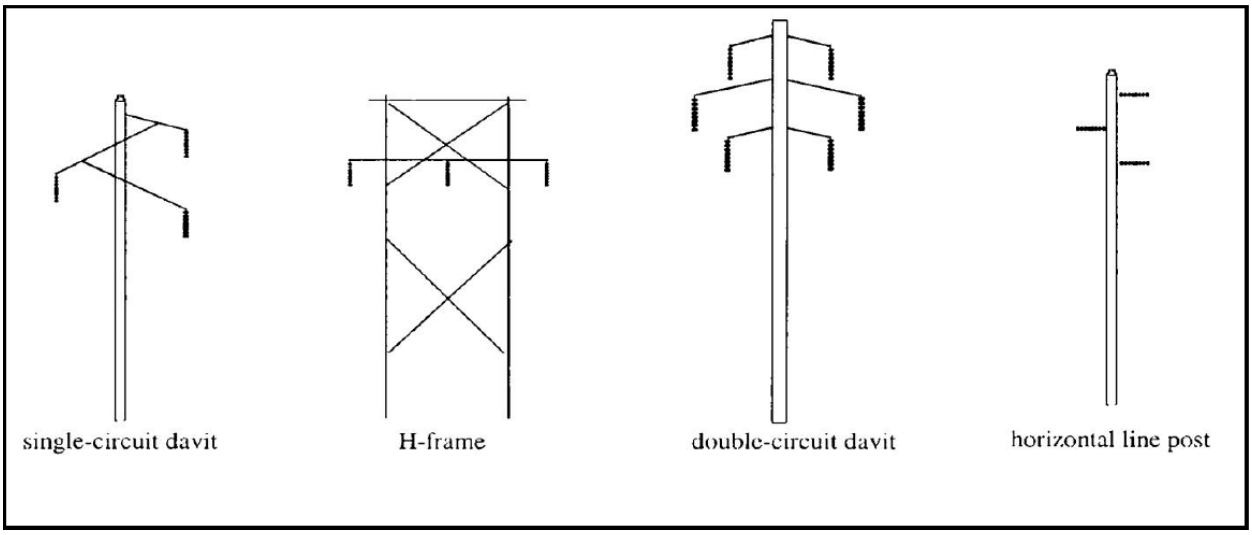
Different transmission structures have different material and construction costs, and require different ROW widths, distances between structures (span length), and pole heights. Span lengths reported by Badger Hollow for the Red and White Routes are approximately 550 feet, the Yellow Route is approximately 500 feet, and the Pink Route is about 275 feet.[13] Construction requirements and costs also vary with the different voltages. Transmission line structures may be steel monopole, wooden or metal H-frame, or historically, metal lattice structures. New lines are most often constructed with single-pole structures because they usually require a narrower ROW than H-frame structures. The ROW width is determined by the voltage of the line, height and type of pole, and span length (distance between structures). ROW widths typically range

[11] PSC REF#: 349995, page 33
[12] PSC REF#: 349995, page 32
[13] PSC REF#: 349995, page 32

from 80 to 150 feet. Many of the ROWs in the Badger Hollow generator tie line are expected to be about 50 feet across.[14] H-frame structures may still be used when environmental impacts such as the risk of bird collisions with the lines require shorter structures.

Pole height and load capacity limitations determine the span length either on the basis of ground clearance or ability to support heavy wind and ice loads, including line galloping. In areas where single-pole structures are preferred, weak or wet soils may require concrete foundations for support. Where a transmission line must cross a street or slightly change direction, larger angle structures may be required. Angle structures are usually more than double the diameter of other steel poles. They are made of steel, usually five to six feet in diameter, and have a large concrete base. The base may be buried ten or more feet below the ground surface. The diameter of the pole and the depth the base is buried depends on the condition of the soils and the voltage of the line.

Figure 3 Examples of some typical transmission structures



Project Design

Badger Hollow developed the proposed project designs for both the solar generation facility and generator tie line. Badger Hollow would construct and operate the proposed facility. Certain details had not been decided at the time of the application, such as the specific solar PV panel choice. Other details may be determined based on a Commission decision, such as the route of the generator tie line or the specific panel siting. The proposed project does not include a battery energy storage system, but there is space within the project boundaries to include such a system, which could be entered into the MISO generator queue at a later time.[15] A battery energy storage system may be installed at a future date, if the economics of that technology are favorable.

[14] PSC REF#: 349995, page 35
[15] PSC REF#: 349485, pages 47-48

PV Subarrays

Groups of solar panels connected to a single inverter are referred to as a "power block," and a group of power blocks is referred to as a "subarray." Some details of what makes up a proposed solar subarray for this project are provided in this section.

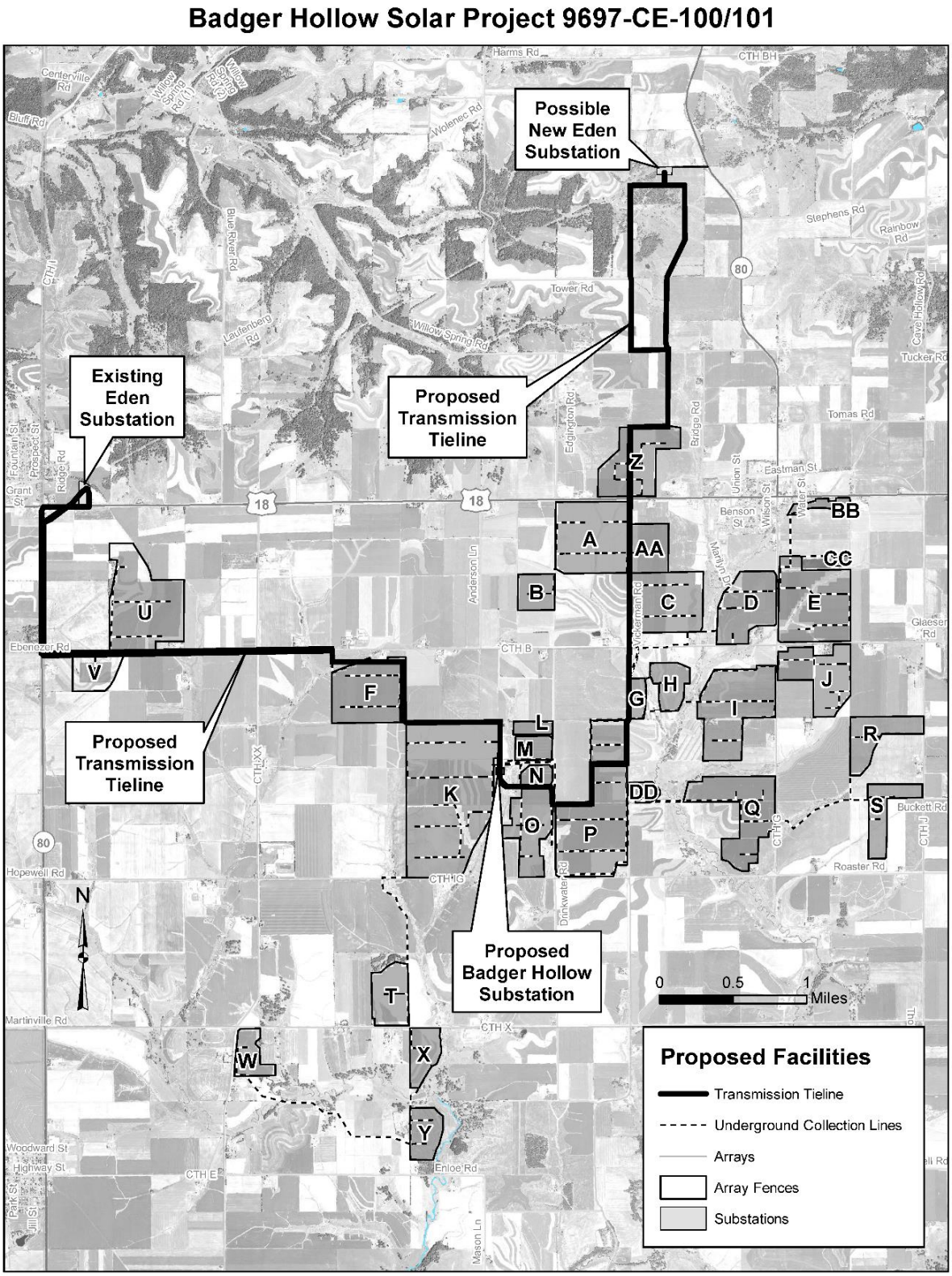
Badger Hollow provided information on a variety of solar PV panels that are under consideration for this project. Manufacturers identified included Canadian Solar, First Solar, Hanwha Qcells, JA Solar, Jinko, Longi, Risen, SunPower, and Trina. Badger Hollow states that a decision has not yet been made on which type of panel to use and that a manufacturer outside of this group with substantially similar panels could be used instead.[16] Panel electric capacities would range from 335 to 445 watt DC per module, with the rectangular panels containing multiple modules and panel sizes ranging from 992 to 1232 millimeters (3.25 to 4.04 feet) in the shorter dimension to 1956 to 2015 millimeters (6.42 to 6.61 feet) in the longer dimension.[17] Depending on the watt rating of the panels, approximately 900,000 to 1,200,000 panels may be needed for the entire site to generate the proposed 300 MW AC.

Inverters

Badger Hollow also provided information about the possible inverter manufacturers that may be used on this project. Inverters are devices that take the DC electricity generated by the solar panels and convert it to the AC electricity that is transported through the electrical transmission and distribution system to provide service at homes and businesses. Inverters would be matched to the size of proposed power blocks to help efficiently deliver the generated electricity to the collector substation. Inverter manufacturers identified included Power Electronics, TMEIC Corporation, and SMA.[18] Inverters could produce AC powers ranging from 2 MW to 3.36 MW, depending on temperature and other conditions at an output AC voltage of 34.5 kV. Permissible input DC voltages range from 1,000 to 1,500 volts for these manufacturers. Physical dimensions range from a width range of 5071 to 6096 millimeters (16.6 to 20 feet), to a depth range of 1920 to 2150 millimeters (6.3 to 7.1 feet), and a height range of 2134 to 2601 millimeters (7 to 8.5 feet). Maximum efficiencies for all the manufacturers exceed 98 percent.

[16] PSC REF#: 349485, page 27
[17] PSC REF#: 349487
[18] PSC REF#: 349487

Figure 4 **Preliminary site layout**



Panels would be installed in portrait orientation to the single-axis tracker system. Either one or two panels could be placed together in a portrait orientation, depending on site space constraints and other engineering details. Solar panel modules would be typically be placed in such a way that a power block would involve multiple panels strung together, with multiple strings associated with one tracker. The tracking system is usually constructed out of aluminum or galvanized or stainless steel. The supports would typically be installed by a pile driver, shown in Appendix D[19] of the application. Inverters are also typically installed using driven pier foundations, similar to the supports for the solar panels, although concrete foundations may be used if soil or ground conditions require increased stability. The inverters may have enclosures that have dimensions of about 15 to 20 feet long by 6 to 7 feet wide by 7 to 8 feet tall. Tracker dimensions can vary from 6.4 to 12.8 feet. Site sample borings indicated that cobbles appeared in the soil at depths of 8.5 to 14.5 feet, which limits the driven pile depth. If driven pile installation would be used, there would be no excavation of topsoil.

The number of panels for each inverter would be determined by the final inverter design selected. Large inverters can accommodate the connection of more modules. The current project is designed around 3 MW AC power blocks; hence, approximately 100 of those power blocks and approximately 140 tracker rows are part of the current design.[20] This design plan could change when final equipment is selected and all engineering is complete. AC collection lines would run throughout the PV subarrays, combining to fifteen circuits that would go to the collector substation for a total length of approximately 55 miles at a trench depth of four feet.[21] Again, this current design concept is subject to revision as further engineering evaluation is performed on the site and the MISO DPP study information is clarified. The collector lines would occupy approximately 59 acres.[22]

Operation and Maintenance Building

Badger Hollow proposes[23] to construct an Operations and Maintenance (O&M) building in the project area. The building would be used as a work location for O&M staff, as well as a storage facility for equipment and spare parts. Badger Hollow intends to purchase a larger property of approximately 10 acres from a retiring dairy farmer to house the permanent O&M building and the collector substation.[24] The building footprint and final design was not complete at the time of application submittal. Badger Hollow expects the building to be approximately 4,000 to 5,000 square feet in size, including 2,700 square feet for warehouse space, and have working area for five permanent employees and more visiting employees.[25] The O&M building would be located on a parcel under one acre in size within the fenced area of the project.

The O&M building could be a reuse of one of the existing structures at the dairy farm operation, repurposed to fit the needs of the O&M building. Badger Hollow notes that "The existing dairy

[19] PSC REF#: 343618
[20] PSC REF#: 349485, page 29
[21] PSC REF#: 349485, page 40
[22] PSC REF#: 353213
[23] Application - Appendix B shows a proposed image of O&M building and parking (PSC REF#: 349526)
[24] PSC REF#: 349485, page 43
[25] PSC REF#: 349485, pages 44-45

has several structures that are in decent condition and may be suitable for renovation and reuse into the O&M building."[26] Other existing structures, such as grain bins and silos may be razed to make room for new structures as needed. A parking area would be located on the same parcel as the O&M building, with approximately ten parking stalls. Outdoor lighting would be installed at the O&M site and would be controlled either by a switch or motion activation. Security fencing for the site would be from 6 to 7 feet high and could be topped with barbed wire. The O&M building would likely use an on-site well and septic system, though a new well or septic system may be necessary if the water quality, flowrate, or performance of either system is determined to be unsuitable.[27]

Project Roads

The project would require roads that would be used during the operation of the solar facility, as well as some temporary access roads only used during construction. Badger Hollow states that roads would exist on approximately 2.4 acres of the proposed site.[28] Badger Hollow also states that no temporary roads or road widening would be expected during the construction process. The longer-duration internal access roads are planned to be up to 56 miles in length across the various project subarray sites. These access roads would be located within the fenced boundary of the project and not available for public use during site operation. All road locations depicted in project maps are preliminary because the final subarray setup is not known at this time.

Project roads would be approximately 12 to 20 feet wide to accommodate construction vehicle requirements. The topsoil and any vegetation or other organic material would be removed prior to subsoil grading and compaction. Removed topsoil would be thin spread near the location of the topsoil removal. Badger Hollow states that access roads would be constructed at grade when it is practicable to do so. The roads would be constructed primarily out of gravel. Specific details of the aggregate specification are not available until the completion of detailed engineering plans.

When the generation site is decommissioned, permanent access roads would be removed unless the landowner requests differently. Aggregate material would be removed from the access roads and the area below would be scarified and decompacted before topsoil would be applied. Topsoil would be re-seeded with an area appropriate mixture to help prevent erosion.

Substations

The proposed project would include construction of a collector substation centered among some of the proposed subarray locations. The collector substation would be located on a parcel approximately 10 acres in size that would also have the O&M building. The substation itself is described to have a footprint of 250 feet by 200 feet. The parcel would be located at the site of a dairy farm that is intending to cease operation, off Drinkwater Road, accessed by a 0.25 mile driveway. After site grading, the substation facilities, such as transformers, would be constructed on hard surfaces, such as concrete pads, with gravel between concrete areas. Erosion

[26] PSC REF#: 349485, page 45
[27] PSC REF#: 349485, page 46
[28] PSC REF#: 353213

control measures would adhere to the Storm Water Pollution Prevention Plan that would be developed for the Badger Hollow site.

The preliminary design of the collector substation is provided in Appendix B[29] of the application. Badger Hollow would purchase this property for the joint substation and O&M building. A perimeter security fence with access gate would surround the substation facilities, as required by the National Electric Safety Code.[30] Within the fenced area, the collector substation would include:

- 34.5kV feeder breakers for each collection feeder;
- 34.5kV collection feeder buses;
- Two 138/34.5kV transformers that have 105/140/175MVA rating;
- Disconnect switches for all breakers;
- 138kV circuit breaker;
- 138kV common bus;
- 138kV overhead transmission lines leaving the substation; and
- A control building with supervisory control and data acquisition (SCADA) equipment.

This substation would be located approximately at the center of the solar panel subarrays. Approximately fifteen collector circuits would run from various power blocks to the collector substation. These collector circuits would be installed underground, and the voltage would be 34.5 kV. Each collector circuit may be daisy chained up to seven inverter stations, but final design would be made after an inverter manufacturer is chosen and associated power block groupings are designed. The application states that these collector circuits would be buried in a trench four feet deep and one foot wide, while maintaining a fifteen foot buffer from the collector circuit centerline to maintain the ampacity of the cables. The collector substation would transform the electric voltage from 34.5 kV on these collector circuits to the interconnection voltage of 138 kV.

Generator Tie Line

In addition to the solar generation facility, Badger Hollow is proposing either the expansion of the existing Eden Substation or the construction of a "New Eden" Substation for the possible interconnection points of the 138 kV generator tie line. The proposed routes would have the generator tie line use single-circuit structures, with the exception of the Pink Route alternative, which could have either a double- or a triple-circuit design. The ROW width depends on the route alternative. In the case of the Red, White, and Yellow route alternatives, the routes would require new easements that are 50 feet wide.[31] The Pink Route alternative would be approximately 40 percent on new 50 foot wide ROWs, while the other 60 percent would likely co-locate with an ATC 69 kV line, which would likely require a 100 foot wide ROW.[32] The

[29] PSC REF#: 349526
[30] PSC REF#: 349485, page 42
[31] PSC REF#: 349995, page 11
[32] PSC REF#: 349995, page 12

ROWs not co-locating with existing assets would be on new easements voluntarily obtained from landowners.

The proposed tie line is planned to use span distances of approximately 550 feet for the Red and White Routes, 500 feet for the Yellow Route, and 275 feet for the Pink Route. The structures would range in height from approximately 70 feet to approximately 85 feet. The structures for the Red, White, and Yellow route alternatives would likely be weathered steel single-circuit monopole structures. Pink route structures would be similar for the new ROW areas, but could utilize existing ATC structures for the co-located portions. Backhoes, cranes and bucket trucks would all be used in the installation of the tie line structures. There would be some vegetation removal and grading in areas of structure installation, however, Badger Hollow indicates that ROW clearing is expected to be light because much of the proposed routes travel over primarily agricultural land.[33]

Descriptions of Badger Hollow's four proposed routes for the tie line follow.

Red Route

The 5.7-mile long Red Route heads generally east 1.3 miles across farm fields from the proposed Project Substation to Vickerman Road. The route then turns north, following the road for 1.8 miles to U.S. Highway (USH) 18. After crossing the highway, the route continues generally north for another 2.6 miles across farmland, to the proposed New Eden Interconnection Substation. The New Eden Interconnection Substation would be constructed approximately 0.3 miles west of STH 80.

White Route

The 6.0-mile long White Route follows the same path as the Red Route from the Project Substation apart from the northern-most 1.6 miles. At Willow Springs Road (one mile north of USH 18), the White Route splits from the Red Route and heads west for 0.25 mile along Willow Springs Road. The White Route then turns north, following the east edge of Tower Road for 0.5 mile, continuing north 0.6 mile across farmland when Tower Road turns to the west. At the existing Wyoming Valley to Eden 138kV ATC transmission line ROW, the White Route then turns east, proceeding for 0.25 mile to a point where it turns north to enter the proposed New Eden Interconnection Substation from the south.

Pink Route

The 5.2-mile long Pink Route travels north and then west of the proposed Project Substation location to the existing Eden Substation on the east side of the Village of Montfort. From the Project Substation, the route travels generally north and west 2.0 miles, making a series of 90-degree turns along new cross-country ROW. At point on CTH B located 2.0 miles east of STH 80, the route turns west to follow the south side of the highway for 2.0 miles. The tie line would be double-circuited with existing 69 kV transmission and distribution lines along CTH B. At STH 80, the route turns to follow the existing lines, heading north on the east side of STH 80,

[33] PSC REF#: 349995, page 39

passing the location of the proposed Hill Valley Substation (a component of the Cardinal to Hickory Creek transmission line project). Approximately 600 feet south of the intersection of STH 80 and USH 18, the Pink Route turns northeast on the ATC Eden to Rewey 69 kV transmission line ROW to continue on that ROW to the existing Eden Substation.

Yellow Route

The 5.4-mile long Yellow Route follows the same route as the Pink Route from the Project Substation to CTH B. At CTH B, the Yellow Route crosses the highway and proceeds west on the north side of the highway for 2.0 miles to STH 80. Along this segment it parallels the existing 69 kV transmission and distribution lines on the south side of the highway. The Yellow Route crosses STH 80 before turning north to travel along the west side of STH 80 for 1.0 mile, paralleling the existing transmission/distribution lines on the east side of the highway. At the intersection of STH 80 and USH 18, the Yellow Route turns east and travels 0.3 mile along the south side of USH 18. The Yellow Route then makes a 90 degree turn to the north to cross the highway and head into the Eden Substation from the south.

Off-ROW Access Roads

Most transmission line construction would occur within the transmission line ROW, with vehicles accessing the ROW from road crossings and then travelling down the ROW. Off-ROW access roads can become necessary where natural features or other limitations prevent accessing the ROW from public roads. Off-ROW access roads may also be needed if crossing features located within the ROW would cause more environmental impacts than using an off-ROW access road. Examples of features requiring off-ROW access roads include slopes greater than 20 percent, stream crossings wider than can be safely crossed using a Temporary Clear Span Bridge (TCSB), and roads and railroads with access limitations.

Badger Hollow states that "The Badger Hollow GEN-TIE construction crews will not require off-ROW access. Access to the transmission line would be made directly along the new ROW or via land under easement for the associated Badger Hollow Solar Farm construction."[34] Badger Hollow clarified that off-ROW access could take place on cropland or pasture areas, but indicated that such access would only occur on leased lands.

Other off-ROW areas required for construction could include laydown yards or staging areas. These would be used for storing construction materials, vehicles, temporary staff buildings, and poles. The areas chosen could require a temporary easement or agreement with a landowner, and may require work to create a level, stable surface. Agreements with the landowner(s) for these areas would specify how any specific laydown yard or staging area would be restored or left after work was completed. Badger Hollow proposes using laydown and staging areas totaling 50 acres in size that may be spread throughout the project area, serving both the generation facility and generator tie line construction. Included in the laydown areas is an area just east of CTH G and north of CTH B, an area north of Iowa Grant Road near a western edge of the project area, an area west of the western end of Whitson Road, and an area north of Iowa Grant Road

[34] PSC REF#: 349995, page 42

and west of Drinkwater Road (near the site of the proposed collector substation). Laydown areas can be viewed on maps in Appendix B of the application.[35]

Project cost

The Commission's review of CPCN applications for wholesale merchant plants is more limited than for projects proposed by public or investor-owned utilities. Under Wis. Stat. § 196.491(3)(d)2 and 3, a wholesale merchant plant CPCN need not demonstrate that its facility would meet the reasonable needs of the public for electricity, and the Commission may not consider economic factors when evaluating the application. The Energy Priorities Law ranks energy conservation and efficiency as its highest priority, with noncombustible renewable resources as the second highest priority. Wis. Stat. § 1.12(4). In docket 5-BS-228, the Commission is considering the need and economics of the proposed purchase of the project by MGE and WPSC.

Project Schedule

Before construction on the proposed project could proceed, a CPCN is needed from the Commission. Badger Hollow provided an estimated project construction schedule in the application. For the generator site, design engineering is expected to start in late 2018 and go through the spring of 2019, followed by a procurement phase for major items from the spring of 2019 through summer 2020. The construction of the generation phase is planned to be in two segments of 150 MW each, with mobilization for the first 150 MW in summer 2019. PV panel installation for the first phase would be started in the summer of 2019 and finished in autumn 2020. Collector substation and electrical tie-in construction would start in the autumn of 2019 and end in 2020. Expected commercial operation of the first 150 MW phase would be at the end of 2020. The second phase and its 150 MW would follow a similar pattern, with PV subarrays installation beginning in the summer of 2022 and finishing in summer 2023, and electrical work starting in autumn 2022 and finishing in spring 2023. Expected commercial operation of the second phase would be the end of 2023.[36] The generator tie line project would follow a similar schedule, with design engineering and equipment procurement lasting from late 2018 to summer 2019, mobilization of personnel by summer 2019, and start of commercial operation by the end of 2020.[37] From the beginning of the project in the middle of 2018 to commercial operation of both phases of the generating facility at the end of 2023, Badger Hollow estimates about 5.5 years to complete all aspects of the project.

Permits and Approvals

Badger Hollow submitted an application to the Commission for a CPCN, as required by Wis. Stat. § 196.491 for proposed electric generation facilities of 100 MW or more. A CPCN requirement is also triggered for the generator tie line, as it is a high-voltage transmission line as defined at Wis. Stat. §§ 196.491(1)(e) and (f). The tie line is in excess of one mile in length and has a nominal voltage of 100 kilovolts or more (specifically 138 kV). The Commission will decide whether to approve, deny or modify the project.

[35] PSC REF#: 349544
[36] PSC REF#: 349491
[37] PSC REF#: 349997

The Commission must make a number of determinations regarding construction projects in a short timeframe, without knowing whether other regulatory permits will be issued. The Commission typically includes language in an order authorizing a project that states an applicant is required to obtain all necessary federal, state, and local permits prior to starting construction as a practical way of mitigating that uncertainty. The reason for this requirement is to ensure the Commission does not approve, and the applicant does not begin work on, a section of a project that would not be able to obtain permits from other regulatory agencies, or begin construction in an area without following possible mitigation or construction requirements that are required by another regulatory agency permit.

The following table lists some of the additional permits, approvals, and standards that are potentially necessary for the proposed project:

Table 1

Approval/Requirement	Agency	Process
Section 404 of the Clean Water Act	U.S. Army Corps of Engineers	Utility General Permit, but requires Section 404 Permit if wetland impact exceeds 10,000 square feet.
Federal Threatened and Endangered Species Review and Bald and Golden Eagle Protection Act	U.S. Fish and Wildlife Service	Information for Planning and Consultation Completed and is included in Appendix A of the application.
Interim policy for Solar Energy System Projects on Federally Obligated Airports	Federal Aviation Authority	Applicant states that none of the components of the Badger Hollow project require any action under this policy.
Certificate of Public Convenience and Necessity (CPCN)	Public Service Commission of Wisconsin	Process includes Commission review of CPCN application and related applications to other agencies, plus joint PSC/DNR environmental assessment and contested case hearing.
Engineering Plan	Wisconsin Department of Natural Resources	Part of the CPCN application process.
Water Resources Application for Project Permits and Utility Structure, Bridge, Wetland General Permit Application.	Wisconsin Department of Natural Resources	General Permits are granted for projects that meet pre-specified design, construction and location requirements. To qualify for a general permit, all required application items need to be submitted.
Visual Receptors Review	Public Service Commission of Wisconsin	Part of the CPCN application process
Wisconsin Pollutant Discharge Elimination System (WPDES) Construction Site Stormwater Runoff General Permit	Wisconsin Department of Natural Resources	Storm Water Management Plan, Erosion Control Plan, and Water Resources Application for Project Permit needed.

Approval/Requirement	Agency	Process
State threatened and endangered species review	Wisconsin Department of Natural Resources	Review of Natural Heritage Inventory database and project area. Identification of any species or habitat records and actions to avoid impacts.
Cultural and Archaeological Resources Review under Wis. Stat. § 44.40	Wisconsin Historical Society (WHS)	Cultural report submitted to Commission for Commission compliance with WHS.
DT1504 and DT1553 permits	Wisconsin Department of Transportation (WisDOT)	Permits are required to construct a new connection to a state highway as well as a permit to construct, operate and maintain utility facilities in highway ROW.
Oversize-Overweight Vehicle permits	Wisconsin Department of Transportation	Some items may require vehicle and road use permits during delivery due to weight or size.
Private Well Notification Number	Wisconsin Department of Natural Resources	Permit is required if a new well is deemed necessary as part of the O&M building.
Utility Permit	Wisconsin Department of Transportation – Southwest Region	Permit necessary to construct or maintain utility crossings for a utility facility.
Driveway Permit	Wisconsin Department of Transportation – Southwest Region	Permit necessary for any new driveways entering to state roads.
Zoning/Conditional Use Permit	Iowa County	Permit may not be required, but is intended to be sought by Badger Hollow.
Zoning/Conditional Use Permit	Grant County	Permit may be required if yellow generator tie line alternative route is selected.
Asbestos abatement prior to demolition	State of Wisconsin Asbestos Program Coordinator	Permit required if asbestos containing materials may be present during any demolition activities.
Utility Permit	Iowa County Highway Department	Permit necessary to construct or maintain any utility crossings for a utility facility.
Utility Permit	Grant County Highway Department	Permit necessary to construct of maintain any utility crossings for a utility facility.
Erosion and Sediment Control Plan Site Permit and Post-Construction Runoff Permit	Iowa County	Permit required for erosion, sediment, and runoff controls.
Sanitary Permit	Iowa County	Permit required if a new septic system is installed for the O&M building.
Driveway Permit	Iowa County	Permit required for new driveways entering to county or township roads.
Driveway Permit	Grant County	Permit required for new driveways entering to county or township roads.
Driveway Permit	Iowa County Towns of Mifflin, Linden, and Eden	Permit required for new driveways entering to county or township roads.

Approval/Requirement	Agency	Process
Driveway Permit	Town of Wingville	Permit required for new driveways entering to township roads.
Building Permit	Iowa County	Permit required for any new building construction.
Building Permit	Grant County	Permit required for any new building construction.
Building Permit	Town of Wingville	Permit required for any new building construction.
Federal Aviation Administration 7460 Notification	Federal Aviation Administration	Notification and Determination may be required for construction of electric transmission lines near airports.

County and local governments have numerous responsibilities that can be addressed during the Commission's CPCN project review. Badger Hollow has discussed the project with local municipalities, including Iowa County's Planning and Zoning Department. Iowa County Planning and Zoning Department's land use permits would not be required because the project is going through the state CPCN process. Potential effects on a local government jurisdiction would be considered by the Commission as an impact on the existing local social environment. Appendix A of both applications contain a record of correspondence and reviews with agencies and local governments.

Minor Siting Flexibility

Similar to wind electric generation projects, as part of its application Badger Hollow provided 25 percent more solar siting areas than required to construct the proposed project to its maximum capacity. The Commission requires these additional siting areas for two reasons:

- To provide flexibility such that, in the event that during the Commission's review some of the applicant's preferred siting areas become undesirable or unusable, those areas may be avoided and alternate siting areas be used instead.
- To resolve unforeseen problems that could arise during the construction process, such as: protecting social, cultural, or environmental resources; avoiding unanticipated sub-surface conditions; accommodating governmental requests; addressing concerns that a landowner may have during the course of construction; taking advantage of opportunities to minimize construction costs; or, improving the levels of electric generation.

The Commission addresses both in any order authorizing the project: for the former in its decisions regarding siting; and, for the latter in a condition allowing applicants minor siting flexibility.

It is the applicant's obligation to minimize the need for minor siting flexibility by rigorously analyzing its project and its proposed project sites, but the Commission does typically authorize certain measures to address the need for flexibility. The Commission recognizes that detailed engineering is not complete prior to it authorizing a project, and that minor siting flexibility may be needed to accommodate the final design of the project. Situations may be discovered in the

field that were not apparent based on the information available to the applicant in development of the proposed project or to the Commission in making its decision. The Commission typically accommodates this necessary minor siting flexibility by including in any order authorizing the project a condition that allows such flexibility.

When such situations arise, the condition typically requires the applicant to consult with Commission staff familiar with the project to determine whether the change rises to the level where Commission review and approval is appropriate. If Commission review is appropriate, the condition requires the applicant to request Commission authorization. Such a request typically takes the form of a letter to the Commission describing:

- The nature of the requested change;
- The reason for the requested change;
- The incremental difference in any environmental impacts;
- Communications with potentially affected landowners regarding the change;
- Documentation of discussions with other agencies regarding the change; and
- A map showing the approved route and the proposed modification, property boundaries, relevant natural features such as woodlands, wetlands, waterways, and other sensitive areas.

Such requests are then typically reviewed by Commission staff knowledgeable about the project, and approval of the requests are delegated to the Administrator of the Division of Energy Regulation.

The order condition typically specifies that the requested change may be granted if the proposed change:

- Does not affect new landowners who have not been given proper notice and hearing opportunity;
- Does not impact new resources or cause additional impacts that were not described in the EA; and,
- Is agreed to by affected landowners, and agreement is affirmed in writing.

Changes that do not meet all three of the criteria listed above would require reopening of the docket.

For any minor siting change, the Commission typically also requires that the applicant:

- Obtain all necessary permits;
- Comply with all requirements included in agreements with local units of government, such as JDAs;
- Comply with all landowner agreements;
- Avoid any part of the project area that the Commission finds unacceptable; and,
- Comply with the applicant's own environmental siting criteria.

Decommissioning Plan

Badger Hollow states in its application that at the end of commercial operation, Badger Hollow would be responsible for removing all of the solar subarrays and associated facilities. Badger Hollow states that they would reserve the right to extend commercial operations by applying for an extension of any required or existing permits.

Decommissioning would include removing the solar subarrays, inverters, transformers, above-ground portions of the electrical connection system, fencing, lighting, substation, access roads, and the O&M facility from the project area. Standard decommissioning practices would be utilized, such as dismantling and repurposing, salvaging/recycling, or disposing of the solar energy improvements, followed by restoration of the site. Decommissioning is estimated to take approximately 12 months to complete.

Badger Hollow states in its application that modules would be inspected for physical damage, tested for functionality, and removed from racking. Functioning modules would be packed and stored for reuse. Non-functioning modules would be sent to the manufacturer or a third party for recycling or other appropriate disposal method. Racking, poles, and fencing would be dismantled, removed, and sent to a metal recycling facility. Holes would be backfilled. Aboveground wire would be sent to a facility for proper disposal and/or recycling. Belowground wire would be cut back to a depth of 4 feet and abandoned in place. Aboveground conduit would be disassembled onsite and sent to a recycling facility. Junction boxes, combiner boxes, and external disconnect boxes would be sent to an electronics recycler. Inverters would be sent to the manufacturer or an electronics recycler, as applicable, and functioning parts would be reused. Material from concrete pads would be removed and sent to a concrete recycler. Computers, monitors, hard drives, and other components would be sent to an electronics recycler and functioning parts would be reused. Unless otherwise requested by a landowner, permanent access roads constructed for the facility would be removed. After all equipment is removed, the project area would be restored to a condition reasonably similar to its pre-construction state. Soil would be de-compacted and re-seeded with an appropriate mix to prevent erosion until it could be returned to agricultural use.

To facilitate a return to agricultural use following decommissioning, Badger Hollow states that the land would be tilled to break the new vegetative growth, which would have enhanced the topsoil condition over the life of the facility. The selection of native prairie and savanna species as the primary vegetation cover for the project could be beneficial for improving and maintaining soil health. The topsoil present on the project site, which has benefitted agriculture for several decades, was created over time by deep-rooted perennial native species prior to its conversion for agricultural use. Even minimally diverse prairies could provide superior rainwater infiltration and control, filtering and improving the quality of groundwater, and increasing soil health. It has been well documented that the use of native prairie and savanna species on the land would result in tangible soil improvements including significantly reduced topsoil loss through erosion, an increase in soil organic carbon levels, improved soil fertility through increased organic matter, and improved soil moisture and drought resilience. (Kimbal *et al*. 2009. Soil Carbon Management., CEC press). In addition, a shift in soil microorganisms to a higher fungal/microbial ratio overall could be expected to improve the soil structure and stability against erosion.

Project facilities would be removed to a depth of four feet as part of decommissioning.

Badger Hollow contractor Applied Ecological Services (AES) is preparing a soil health assessment plan for properties proposed to host solar facilities, to establish baseline soil characteristics and health. Typical soil health assessments would include quantification of a variety of factors, such as water capacity, hardness, organic matter, protein, respiration, active carbon, chemical composition, and microbial content and other factors. Surface and subsurface water sampling on the site is also proposed. The University of Wisconsin Agricultural Ecology's program on soil health measurement would be consulted as well as Natural Resources Conservation Service recommendations. At decommissioning, similar methodologies would be employed to accurately compare the soil health conditions.

Badger Hollow would be responsible for decommissioning the project and associated facilities. Badger Hollow has included an obligation to decommission the project components in the project's solar lease and easement agreements with participating landowners. Because of the uncertainty in predicting the value of equipment reuse and salvage, Badger Hollow would create a decommissioning plan at the 15th anniversary of the commencement of operations. At that time Badger Hollow would post a form of financial security, such as a surety bond, letter of credit, escrow account, reserve fund, parent guarantee or other suitable financial mechanism, if any net cost of decommissioning exists.

Environmental Analysis

Overview

There would be potential impacts from constructing and from operating the new proposed facilities. These potential impacts and, if applicable, corresponding mitigation actions, are described in the following sections.

The project would use different equipment types depending on the phase of construction. During access road construction and initial grading of the site, dozers, motor graders, and rollers would be used. Pile drivers, skidsteers, and telehandler forklifts would be used during the installation of supports and panels. Excavation equipment such as backhoes would be used for collection circuit trenches, with the use of horizontal directional drilling (HDD) planned for wetland and waterway crossings. Backhoes, vehicle mounted power augers, cranes, and bucket trucks would be used during installation of the tie line.

Construction activities would take about sixteen months. Construction is proposed to begin in summer of 2019, after all permits and approvals are received, and continue until autumn of 2020. Work would begin with site preparation, including grading the area as needed and installing access roads and laydown areas. As the project area predominately consists of open agricultural fields, grading and vegetation removal for the solar subarrays would be less than if the project was installed in areas with other land covers. After panel supports are installed, using a pile driver, the panels would be delivered and installed on a rolling basis from April to November of 2020. The project is projected to be in commercial operation by the end of December of 2020. Restoration and monitoring activities may occur after this time, depending on site or project approval conditions.

Potential impacts to natural resources

Geology, topography and soils

The existing topography within the project area can be described as rolling hills, though the developed portion has a relatively flat grade. Surface elevations range from 1,011 to 1,234 feet above mean sea level. Most of the project area is level to nearly-level, which is consistent with the current agricultural use. A few streams and drainages are also present.

The Wisconsin Geological and Natural History Survey (WGNHS) Bedrock Geologic Map of Wisconsin maps the bedrock of the entire project area as the Sinnipee Group, which primarily consists of Ordovician-aged dolomite with limestone and shale. The Ancell Group, primarily sandstone with minor limestone, shale, and conglomerate, is also mapped nearby. Based on a WGNHS Depth to Bedrock Map of Iowa County, Wisconsin, the expected depth to bedrock at the project site (and most of Iowa County) is 0 to 20 feet below ground surface (ft bgs).

A geotechnical investigation was performed for the project area. Subsurface conditions generally consist of 0.1 to 4.0 feet of topsoil with organics over very soft to very stiff lean, fat, and silty clay with trace gravel generally encountered from 3.5 to 15 ft bgs. The underlying layer encountered was medium-dense to dense poorly-graded sand (SP) with cobbles at 11 to 15 ft bgs. Groundwater was encountered in 3 of 21 borings at depths of 5, 5, and 8 ft bgs. The expected depth to bedrock along the routes (and most of Iowa County) is 0 to 20 ft bgs.

Based on desktop research described above, nearby water well logs, and auger refusals noted in the Terracon boring logs, bedrock should generally be expected at depths of 10 to 15 ft bgs. Pile foundations could exceed these depths in order to resist frost heave forces, in which case drilling holes several feet into the bedrock may be necessary. The holes may then be backfilled with native soil cuttings, imported granular fill, flowable fill, or cement to support the pile foundation. Ballast foundations could also be used in instances of shallow pile refusal due to bedrock or cobbles. None of these methods are expected to negatively impact private wells in the area.

According to the Natural Resources Conservation Service the soil in the project area is predominately Tama silt loam (48 percent of site) and Dodgeville silt loam (36 percent). Tama silt loam is loess, or wind-blown fine sediment, and is classified as lean clay (CL) by the Unified Soil Classification System (USCS). Dodgeville silt loam is loess over loamy residuum weathered from dolomite and is classified as CL by the USCS. The majority of the rest of the site is also comprised of silt loam units classified as lean clay.

Water resources

Wetlands

Identification and Quality

There are 76 potential wetlands within the project boundary. A wetland field delineation was conducted for the majority of the proposed project footprint and a 100-foot buffer around proposed project infrastructure (wetland investigation area). A total of 31 wetlands are present within the wetland investigation area, classified as seasonally flooded basin, shallow marsh, wet meadow, and sedge meadow. The most common wetland type is seasonally flooded basins that are either

farmed wetlands or wetlands found along stream features. The next most common is wet meadow, and there are some sedge meadows. The least abundant wetland type identified is shallow marsh. An additional 12 wetlands were desktop identified within the proposed project footprint.

Anticipated Impacts

Temporary wetland fill within the total project area is proposed for the placement of construction matting. Permanent wetland fill may occur if the driveway for the O&M building needs to be replaced. Wetland fill may also occur for footings and grading associated with the perimeter fencing. The proposed wetland impacts are summarized in the table below and assume fill for the driveway and fill for fence installation.

Table 2 Proposed Wetland Impacts

Impact Location	Impact Activity	Temporary Wetland Fill (sq. ft.)	Permanent Wetland Fill (sq. ft.)
Arrays	Fence	N/A	181
O&M Building	Driveway	N/A	240
Pink Transmission Line Route	Construction matting	8,272	N/A
Yellow Transmission Line Route	Construction matting	13,914	N/A
Red Transmission Line Route	Construction matting	7,300	N/A
White Transmission Line Route	Construction matting	8,985	N/A

Forested wetland clearing is not proposed for this project.

Impact Minimization

To minimize temporary wetland disturbance, all storage and staging areas would be located in uplands. Vehicles and equipment would be tracked or low ground pressure, or would work from construction matting. Construction would occur during frozen ground conditions, when possible. Soils disturbed by vehicular rutting greater than six inches deep would be leveled and restored. All underground collection lines in wetlands would be installed via HDD, minimizing impacts to wetlands.

To minimize permanent wetland disturbance, existing infrastructure would be utilized for the proposed O&M building. The proposed project substation is located in upland adjacent to the O&M building. An engineering evaluation would be performed on the existing driveway to determine if any modification or replacement of the driveway is needed. Wetland impact would be minimized to the maximum extent practical, if driveway improvements are required.

Site restoration, including re-vegetation, of the disturbed areas would be completed as soon as possible following construction. Sediment and erosion control devices would be installed before ground disturbance occurs to reduce erosion and trap sediment from entering sensitive resources and would be in place until vegetation is re-established. Once permanent erosion control measures are installed and vegetation is re-established, temporary erosion control measures would be removed.

Disturbed wetlands located outside of active agricultural areas would be seeded with a cover crop in accordance with re-vegetation requirements and all applicable permit conditions. Seeding

disturbed wetlands with a cover crop would help prevent the establishment of invasive species, and would not compete with the existing seed bank, which would be maintained with the use of soil segregation. While some wetlands contain invasive species such as reed canary grass, wetlands of higher quality, dominated by native species, are also present within the project area. Wetlands not infested with invasive species should be evaluated individually for re-vegetation with either a native seed mix or by allowing the native seed bank to re-establish naturally. Wetland areas infested by invasive species should be re-vegetated with an annual cover crop.

Proper protocols should be implemented to prevent the introduction or increase in abundance of invasive species. Best management practices (BMP) should be used to prevent the spread of invasive species, including cleaning construction vehicles and using construction matting. To minimize the introduction of new invasive species populations, equipment and matting should be cleaned before entering the project site or moving between sites. Implementing utility line ROW BMPs would help minimize invasive species impacts to wetlands.

A qualified environmental inspector would conduct weekly stormwater inspections as well as inspect construction within sensitive environmental resources to ensure that proper BMPs are employed, permit conditions are met, and restoration is completed.

Waterways

Identification and Quality

There are 35 waterways identified in the DNR's waterway mapping database within the project area boundary, 17 of which are within the proposed project footprint. All DNR-mapped waterways are assumed to be navigable, and thus state jurisdictional, unless determined otherwise through a navigability determination performed by DNR staff. DNR determined 10 of the mapped waterways to be non-navigable at the location of several fence crossings. Downstream portions of these waterways are considered navigable. Navigability determinations would be finalized when site ground conditions allow, if the proposed project is approved. The Blue River, a waterway designated as a trout stream and Area of Special Natural Resource Interest by DNR, is located within the project area, west of the proposed Red/White transmission route. The Blue River is not proposed to be crossed or impacted by the project.

Anticipated Impacts

The existing driveway for the O&M building and project substation would be evaluated to determine if modification or replacement of the driveway and associated culvert within a waterway is needed. There is one fence crossing of a navigable waterway. Along the Pink overhead transmission line route, six waterway crossings would require the installation of a TCSB to accommodate equipment access for construction and site restoration. The Yellow Route would require six TCSBs, the Red Route would require three TCSBs, and the White Route would require three TCSBs.

Impact Minimization

The HDD method is proposed for installing the waterway crossings for the underground collection lines, potentially avoiding all impacts below the ordinary high-water mark (OHWM) of waterways. A plan should be prepared that would be implemented if an inadvertent release of drilling mud (frac-out) occurs during an HDD operation. The proposed HDD construction method would include sediment and erosion control BMPs to minimize sedimentation impacts

when working near waterways. Geotechnical survey work should be completed prior to initiating construction to determine if the locations proposed to be crossed using HDD have suitable soil and bedrock types for HDD use. If the HDD method requires withdrawing water from any waterway, a floating apparatus should be used to keep the pump and hose off the waterway bed, and a screen used to prevent impacts to aquatic species.

The number of potential temporary stream crossings with equipment has been minimized in areas where construction could be completed by accessing the ROW on either side of the stream or from adjacent roads. All proposed TCSBs would completely span each waterway with no supports within the waterway channel. Appropriate barriers, such as geotextile fabric and silt sock, would be installed to prevent sediment and materials from entering the waterway during TCSB use. The impacts of the TCSB placement and removal would be minimal if it is constructed properly. Potential impacts are expected to be short-term, and include disturbance to the bank of the waterway, cutting of riparian vegetation, disruption to the invertebrates, fish, and wildlife associated with the waterway, and public access limitations. Impacts to waterways could be avoided if the proposed project would not cross the riparian corridor. Impacts can be minimized by avoiding direct disturbance of the bed and banks of the waterway, limiting vegetation cutting in the riparian zone, scheduling construction to avoid disrupting sensitive species, and limiting the amount of time necessary to complete construction. Waterway construction requirements include the placement of the TCSB above the OHWM and at the top of the bank of the waterway. Another requirement is that the TCSB must be anchored to a tree or into the ground so as to prevent it from flowing downstream in the event of flooding. Furthermore, in order for the TCSB to be placed as a clear span bridge, the bridge must be at least five feet above the waterway to allow for navigation, unless the requirements in Wis. Admin. Code § NR 320.04 are met. Following removal of the TCSB, waterway banks would be restored to original contours and stabilized immediately with topsoil, seeding and mulch, or erosion matting.

Any in-water work and placement and removal of TCSBs cannot occur during the fish spawning timing restriction period, which is March 1 to June 15 for non-trout streams. The placement and removal of the TCSBs and in-water work would comply with these waterway-specific timing restrictions, unless the local DNR Fisheries Biologist reviews the proposal and determines that these timing restrictions can be waived.

State wetland and waterway permitting

DNR participated in the review process with the Commission as required under Wis. Stat. § 30.025. As part of its review, DNR determines if the proposed project is in compliance with applicable state water quality standards (Wis. Admin. Code chs. NR 102,103, and 299). If the project is found to be in compliance with state standards, DNR would issue a waterway permit to the applicant, as promulgated under Wis. Stat. § 30, and/or a wetland permit, as promulgated under Wis. Stat. § 281.36. It is anticipated that this project, as currently proposed, would qualify for permit coverage under Wis. Stat. § 30.025.

Compensatory wetland mitigation is not required for this project, per Wis. Stat. § 281.36(3n)(d)2.

Woodland impacts

Upland woodlands in the project area are typically comprised of maple/basswood/ash (*Acer saccharum*/*Tilia americana*/*Fraxinus pennsylvanica*) or burr (*Quercus macrocarpa*) and white oak (*Quercus alba*). The woodland communities are defined by the Natural Communities of Wisconsin as Southern Mesic Forests, Southern Dry-Mesic Forests, or Southern Dry Forests. Some red *(Pinus resinosa*) and white pine (*Pinus strobus*) plantations are also located within the project area.

Wooded wetlands within the project area are typically located in riparian areas and are dominated by cottonwood *(Populus deltoides*), box elder (*Acer negundo*), silver maple (*Acer saccharinum*), and green ash (*Fraxinus pennsylvanica*). The wooded wetland communities are typical of Floodplain Forest, as defined by the Natural Communities of Wisconsin.

Construction of the subarrays would require the permanent clearing of 3.93 acres of upland woodland. These woodlands are predominantly fencerow trees at the edges of farm fields.

An area extending 15 feet to each side of the underground collector lines easement center line would be cleared to allow for the passage of the equipment used to place the lines. 0.31 acres of upland woodland impacted by underground collection lines would be maintained in an open (treeless) condition.

The transmission tie line woodland impacts for each of the proposed routes are as follows:

Red Route
The Red Route does not cross any forested land. The only wooded areas crossed by the Red Route are scattered individual trees and small windbreaks along agricultural fields. No other wooded areas are located within the proposed corridor of the route.

White Route
The White Route crosses a small area of forested land. This approximately 1,700-foot-long segment at the far north end of the proposed route would require the clearing of 2.2 acres of primarily burr oak and walnut. The only other wooded areas crossed by the White Route are scattered individual trees and small windbreaks along agricultural fields.

Yellow Route
The Yellow Route does not cross any forested land. The only wooded areas crossed by the Yellow Route are scattered individual trees and small windbreaks along agricultural fields. No other wooded areas are located within the proposed corridor of the route.

Pink Route
The Pink Route does not cross any forested land. The only wooded areas crossed by the Pink Route are scattered individual trees and small windbreaks along agricultural fields. No other wooded areas are located within the proposed corridor of the route.

To prevent the spread of oak wilt, seasonal tree clearing restrictions would be observed.

Rare species

The state's Endangered Species Law, Wis. Stat. § 29.604, makes it illegal to take, transport, possess, process, or sell any wild animal that is included on the Wisconsin Endangered and Threatened Species List. In addition, it is illegal to remove, transport, carry away, cut, root up, sever, injure, or destroy a wild plant on the Wisconsin Endangered and Threatened Species List on public lands. Although utility practices are exempted from the taking prohibitions of listed plant species on public lands, it may still be prudent for the applicant to actively avoid activities in certain areas that are known to host rare plants. The Federal Endangered Species Act protects all federally listed animals from direct killing, taking, or other activities that may be detrimental to the species. Federally listed plants have similar protection, but the direct killing or taking prohibitions are limited to federal lands or when federal funds/permits are necessary. In addition, there may be other state and federal laws protecting rare species including the federal Migratory Bird Treaty Act, the federal Bald and Golden Eagle Protection Act, and the Protected Wild Animals (Wis. Admin. Code § NR 10.02).

DNR has identified endangered resources that could be present within the proposed project's boundaries, the potential impacts on these resources, and the mitigation measures that should be implemented. This EA only discusses the species that may be impacted by this project. It does not include species that may be found in the project area but would not be impacted by the proposed activities, as determined by DNR species experts and/or Endangered Resources Utility Liaison. In addition, incidental take of state threatened or endangered animal species as defined by Wis. Stat. § 29.604 would likely not occur as a result of this project.

This list and information are taken from the state's Natural Heritage Inventory (NHI) database. The project area evaluation includes both the area within the project boundary and a buffer of one mile for terrestrial and wetland species and a two-mile buffer for aquatic species. While the existing sources of information are important for estimating impacts to rare species, they are incomplete. Additional rare species beyond those currently identified may actually be present within project boundaries. The NHI database is updated frequently and should be reviewed within one year of project activities occurring to ensure species information is as accurate as possible.

Herptiles (Reptiles and Amphibians)

There is one rare reptile which may be present in areas of suitable habitat. WDNR made recommendations to avoid impacts to this species. Badger Hollow does not expect to impact the area identified as suitable rare reptile habitat; and if it does, it would assess the suitability of the habitat within the area. If suitable habitat is identified, Badger Hollow would conduct presence surveys, and if presence is determined, Badger Hollow would coordinate with WDNR to avoid impact to this species.

Natural Communities

There is a dry prairie natural community that may be present within the project boundary. Natural communities may contain rare or declining species and their protection should be incorporated into the project design as much as possible. Therefore, minimizing impacts to and/or incorporating buffers along the edges of this natural community is recommended. If project impacts are anticipated to the area identified as potential natural community, Badger

Hollow would conduct a field visit to determine whether the natural community is present in the area noted by WDNR. If so, protective measures would be incorporated into the project design to the extent practicable.

Wildlife impacts

The predominant land use of the proposed solar facility is agricultural row crops, along with areas of pasture and fallow fields. Considering the current habitat of these fields, the most common wildlife occupants are likely species that are generally more common and are accustomed to agricultural habitats. Examples of these species could include deer, squirrel, raccoons, mice, moles, voles, common perching birds, red-tail hawks, reptiles, amphibians, pheasant, grouse, turkey, and geese.

Placement of a large scale solar facility could impact and change the uses by various wildlife species of the existing landscape. Badger Hollow's proposal involves fencing around the proposed substation of the facility and around every subarray area. The majority of access roads proposed for the facility would be located inside the fenced areas. Badger Hollow is proposing to implement a grass and native meadow planting habitat under and around most of the developed areas of the site. That vegetative habitat change, along with the panels themselves, would be different than the current predominant land use.

Wildlife that would reside within the construction zone of the project would likely be temporarily displaced to adjacent habitats during the construction process. These species generally do not require specialized habitats and would be able to find suitable habitat nearby. Comparable habitat would be near the facility locations, and it is possible that these animals would likely be displaced only a short distance.

Once the facility is operational, the current agricultural habitat would be replaced by a modified habitat that would be attractive to some species and less attractive to those that use the open agricultural fields and pasturelands. Access to the facilities would be limited by a perimeter fence. Although a variety of birds, small mammals, reptiles, and amphibians would likely still be able to gain access to the facilities to use habitats under and around the solar subarrays, access would be more limited for larger wildlife. Fencing around facilities may also disturb wildlife movement corridors.

Large-scale solar facilities are a relatively new addition to the landscape and research is ongoing to determine impacts to wildlife. Most research on the impacts of solar facilities on wildlife has occurred in different habitats than are found in Wisconsin. In 2016, a multi-agency collaborative working group released an avian-solar science coordination plan[38] that discussed ways solar development may affect birds and areas where more information is needed to understand potential impacts to birds. There have been few studies, particularly systematic studies of mortality, at comparable large-scale solar facilities.

[38] The Multiagency Avian-Solar Collaborative Working Group, 2016, Avian-Solar Science Coordination Plan, November

Collision with panels is one way birds could suffer injury or mortality at large scale solar facilities. Birds could mistake the solar panels for bodies of water while flying overhead, and when they attempt to land, can suffer impact trauma. While it is not considered a likely impact at this time, there is the opportunity to use the Badger Hollow site to conduct a systematic study of wildlife impacts, similar to those done after the construction of wind energy facilities in the state. Information gained from such a study could be useful in future reviews of these types of projects.

There is a possible impact to wildlife through the fencing of the subarray sites. The landscape is currently made up of large agricultural fields with small woodlots, waterways, and wetlands that provide corridors for movement of wildlife. Deer likely access the fields throughout the year. Each subarray site is proposed to be fenced for security reasons. Many animal species would find this a barrier to movement, which would cause habitat fragmentation in the project area. Where a solar facility fenceline runs along a road, deer that start to proceed along the ROW may have movement restricted, which could lead to more interactions with drivers. Deer could attempt to leap the proposed fence, and those that clear the fence may find themselves trapped in the solar facility, risking damage to themselves or the facilities. Similar to avian impacts, there is almost no published research on how these large fenced areas with solar panels affect wildlife, particularly in the upper Midwest.

The Minnesota Public Utilities Commission recently required large-scale solar facilities to use 8-foot fencing to reduce the chance deer would be able to enter the site. It required no barbed wire be used in the fencing selection. It also required large-scale solar project developers consult with the Minnesota DNR to evaluate ways for wildlife to enter and leave the site while maintaining compliance with security requirements. Reporting wildlife access or mortality near the site might also inform future reviews of similar large-scale solar projects in the Midwest.

Badger Hollow has worked with a native restoration consultant to develop a vegetation management plan for the project facilities during and after construction. The plan addresses erosion control, site stabilization, invasive species control, and long-term native meadow habitat establishment. This is discussed further in this document in the section "Vegetation Management."

Historic resources

Following the recommendation of WHS, Badger Hollow contracted the University of Wisconsin-Milwaukee Cultural Resources Management (UWM CRM) to perform a desktop review of potential archaeological and historic resources.

Based on the UWM CRM report, no previously documented archaeological resources would be impacted by project development. Four historic structures were identified within or adjacent to the project boundary that require a field investigation to determine if they might be affected by project development. Badger Hollow performed the field reconnaissance of the historic structures in June 2018. The survey is complete and the report was submitted to the PSC. Further evaluation has determined there would be no impact to these structures.

Invasive species

Construction of the project may cause the spread and establishment of invasive species. Construction equipment traveling from infested to non-infested areas could spread noxious or invasive weed seeds and propagules. The removal of existing vegetation during construction could create conditions conducive to the spread and establishment of noxious and invasive weeds, which often invade and persist in areas after disturbance.

Non-native invasive species cover is more limited due to the intensive weed management associated with agriculture over much of the acreage of the project. Likely areas where invasive species would be located include field edges, road ROWs, wetlands and waterways, and any upland areas not actively farmed or intensively managed.

Badger Hollow has not completed onsite surveys for invasive plant species. Due to the heavy row-crop agricultural land use within the tie line project area, invasive plant species would likely be found in non-cropped areas adjacent to and within wetlands and field edges. Invasive plant species likely to be encountered would be those common to agricultural areas including:

Alliaria petiolata—Garlic mustard
Arctium minus—Common burdock
Bromus inermis—Smooth brome
Centaurea maculosa—Spotted knapweed
Cirsium arvense—Canada thistle
Elytrigia repens—Quackgrass
Melilotus alba—White sweet clover
Melilotus officinalis—Yellow sweet clover
Phalaris arundinacea—Reed canary grass
Poa pratensis—Kentucky bluegrass
Tanacetum vulgare—Tansy
Trifolium pratense—Red clover
Trifolium repens—White clover
Typha angustifolia—Narrowleaf cattail

Construction crews would use sound mitigation methods to avoid the spread of invasive plants or disease-causing organisms. Whenever possible, the contractor would follow the procedures outlined in the WDNR's Best Management Practices for Preventing the Spread of Invasive Species in Wetlands[39]. Following the BMPs is expected to be effective in the control of the spread of invasive plant species.

Invasive species are classified as restricted or non-restricted by the DNR under Wis. Admin. Code § NR40. No prohibited species were reported in the application materials. Badger Hollow states that the locations of invasive species would be used in project planning. Badger Hollow

[39] (WDNR, 2012) (https://dnr.wi.gov/topic/Wetlands/documents/WetlandInvasiveBMP.pdf)

states that machinery used in construction would be cleaned prior to delivery. To prevent the spread of invasive species into other areas to the extent practicable, all equipment used, including construction matting, would be cleaned prior to work in areas without invasive species. Clean up would occur on areas of aggregate materials within the project site. Areas of disturbed soils should be stabilized and planted with a non-invasive plant cover crop as soon as possible. Seed mixes and any mulches used in the restoration phase of the project would need to avoid any species identified as regulated non-native invasive species.

During the operation of the facility, invasive plant management may be necessary. Badger Hollow states that mowing and herbicide treatments would be used as needed to control weedy and invasive plant species on site, with all herbicide treatments done by certified applicators.

Vegetation and stormwater management

Solar facilities in the upper Midwest typically have vegetation growing on the array sites around the site perimeter as well as between and underneath panels. This vegetation decreases the amount of impervious surface associated with the site and assists in managing storm water runoff and erosion. However, the vegetation needs to be established and managed in a way that avoids conflicts with the operation of the solar generation facility. Native plant species that can create a healthy and sustainable groundcover on the site are preferred to any noxious or invasive plants. Solar developers must also look for plants that would not grow tall enough to shade the PV panels or interfere with other equipment.

As part of its application, Badger Hollow provided an erosion control and stormwater management plan. This is Appendix L of the application. Part of this requirement is related to the need to meet WPDES regulations as established by the Clean Water Act and guided by the Wisconsin DNR. WPDES and the EPA National Pollution Discharge Elimination System provide the framework of requirements for compliance to discharge stormwater from a construction site. In addition, Badger Hollow prepared a drainage study and stormwater management review to analyze the drainage and stormwater management of the proposed Badger Hollow Solar Farm and provide design information to use in the civil and structural engineering design. Badger Hollow states in its application that in order to reduce the potential for erosion and scour at the dripline of the panels, the vertical clearance between the panels and the ground would be minimized and would be less than eight feet maximum elevation. As part of its construction plan, erosion and sediment control measures have been specified and would be used during project construction.

There has been significant interest in using the large, relatively undisturbed ground in a solar generation facility to promote habitat for native bees and other pollinators. Minnesota and Illinois passed legislation that defines what voluntary criteria need to be met for a company to refer to a solar site as benefiting pollinators. Wisconsin does not have this criteria officially defined, although a team at the University of Wisconsin – Madison has developed information[40] and a scorecard to apply scientific criteria to a project's vegetation management plan to assess its value to pollinators. Pollinators, including the Monarch butterfly (*Danaus plexippus)*, have been in serous decline in the U.S. and worldwide. These beneficial insects have received national

[40] https://pollinators.wisc.edu/solar/about/

attention in recent years with the creation of a federal strategy to promote the health of honey bees and other pollinators. Significant losses of these pollinators threaten worldwide agricultural production and the sustainability of native plant communities. The federal initiative mentioned above identified and described utility ROWs as a key component in the successful implementation of the federal strategy to promote pollinators. Planting a site with a pollinator friendly seed mix can benefit wildlife as well as the aesthetics of a solar generating facility.

Badger Hollow has developed a "Ground Cover Strategy" document41 which outlines its plans for how to establish and maintain ground cover and habitat on the solar facility site. Badger Hollow proposes to use a native meadow groundcover throughout the site. In areas under the panels, this would function as a filter and act as a permanent BMP, and capture runoff, sediment, and other pollutants. In addition to stormwater benefits, the native groundcover would reduce vegetation management costs during operations, reduce snow drifts, improve drought resistance, and create and conserve pollinator and wildlife habitat.

Prior to construction, a site assessment, including soil analysis, a review of the final layout, and construction schedule would be used to identify an appropriate seed mix. If timing allowed, immediately prior to construction Badger Hollow would test for herbicide levels and survey crop history to identify a ground preparation approach, which could include minor tillage and re-application of corn stalk and management of pre-emergence herbicide issues.

During construction, as facilities installation is completed in disturbed areas, an initial seeding would take place to provide for quick re-vegetation to support erosion control during construction. In areas where existing cover is already established (e.g., swales, pasture or, alfalfa), no-till drilling and/or selective application of herbicide for weed control would be possibilities. Some areas could be enhanced with pollinator seed mixes after array installation.

An initial establishment period starting at commercial operation would be expected. In the first year, at least two mowings would likely be required to control annual weeds from going to seed, and to allow native perennials to establish with minimal competition. In the second year, a single mowing in the spring would likely manage annual weeds. If found, large patches of aggressive invasive weeds would be targeted, potentially with herbicide treatment. In areas around the arrays, a second mowing later in the season would be used selectively to prevent overgrowth of species that could potentially obstruct sunlight from reaching the panels. Vegetation management on the array sites would likely require mowing and weed trimming to keep vegetation from interfering with the panels and other equipment. Other solar facilities planted with low growing native grasses and forbs generally require mowing once or twice per growing season.

Starting at the third year and throughout the life of the facility, maintenance would be expected to be limited to a single site-wide annual mowing during either early spring or fall, depending on specific conditions. Annual mowing would prevent woody species from getting established and would reduce the risk of wildfire. Additional targeted mowings to prevent overgrowth would be used as needed.

[41] PSC REF#: 352785

It would be beneficial for wildlife if mowing would be delayed in early summer until ground-nesting birds had finished nesting. The avoidance period would typically be from May 15 through August 1 of each year. Some limited weed trimming activities could occur during this period if staff were trained to look for and avoid any areas of nesting birds prior to activities. Without knowing specifically when Badger Hollow proposes to manage vegetation on the site, this EA cannot specifically quantify expected impacts, but does propose that Badger Hollow work to develop a mowing regime that avoids impacts to nesting birds. The Commission could require any vegetation management plan be reviewed by Commission and DNR staff prior to its implementation to achieve this mitigation goal.

Generator tie line

Vegetation management in a transmission line ROW refers to the ongoing process of preventing incompatible vegetation from interfering with the safe operation of the transmission line over time. In the construction phase, all vegetation is commonly removed from the ROW, while over time, there would need to be regular monitoring of vegetation in and adjacent to the ROW, with work done to address incompatible vegetation. This is referred to as Utility Vegetation Management.

Vegetation management in a transmission line ROW must meet requirements set by North American Electric Reliability Corporation (NERC) (FAC-003-04) and the requirements of the transmission company's "Vegetation Management Plan." The NERC standards are established to help maintain a reliable transmission system by requiring utility monitoring of the ROW and its vegetation, creating work plans to address problems, and carrying out work to ensure distances between vegetation and the transmission lines are maintained. These standards exist to minimize vegetation-related outages on the transmission line system.

The type of vegetation allowed to regrow in a transmission line ROW and the utility's right to manage vegetation are part of a property owners' easement contract or lease with the utility. The easement or lease should specify the rights of the utility to address vegetation growing in the ROW, as well as any "hazard trees" outside the ROW but within "fall-in" distance of the lines. Management activities can include a range of mechanical methods including mowing or use of chainsaws where there is woody species regrowth. Herbicide use is allowed only if agreed to by the landowner. Landowners and the utility should discuss planned work and what vegetation is compatible with the ROW at the initial easement negotiations as well as ongoing discussions prior to vegetation maintenance work in subsequent years to reduce impacts and conflicts with landowners while continuing safe operation of the transmission lines.

The land agreements are being made between landowners and Badger Hollow; however, the results of the buy/sell docket before the Commission may cause the future owner to be a public utility. If landowners negotiated a different style of ROW management, it is unclear what would happen if another utility took ownership of the tie line. The easement or lease may need to be renegotiated to change how the ROW is managed. Future impacts may also require wetland permits.

Similar to vegetation management in the solar arrays, avoiding the cutting of vegetation in more natural habitats, including grasslands, during the bird nesting season would reduce impacts to those species.

Air quality

Temporary, localized impacts to air quality would occur during the construction phase of the project. These impacts would be a result of construction machinery and delivery vehicles in the project area. Diesel engines can create exhaust impacts that are typically short term in nature, but can be a nuisance or, in high enough quantities, a health hazard. Keeping vehicles and construction equipment in good working order is one way to mitigate these impacts.

Fugitive dust may be generated from excavation or grading work, exposed soils, or materials transport, and could create a nuisance for local homeowners or drivers. The extent of fugitive dust generated during construction would depend on the level of construction activity, weather conditions such as high winds, and the moisture content and texture of soils being disturbed. High winds and dry conditions increase the chance of fugitive dust affecting air quality. Watering exposed surfaces and covering disturbed soils with quick-growing non-invasive plant species can reduce the chance of fugitive dust.

No air quality impacts would be expected to occur once construction activities were complete and the project was operational. Solar facilities generate energy without the creation of regulated pollutants or carbon dioxide.

Solid wastes

Solid wastes would be generated during the construction of this project and would need to be removed to appropriate waste disposal or treatment facilities. Examples of the types of wastes expected to be generated include scrap steel and other metals, sanitary waste, scrap plastics and wood, and other items used by construction staff.

During operation of the solar generating facility, staff using the O&M building would generate waste, which would need to be removed to appropriate waste disposal facilities. This would likely include defective or broken electrical materials, empty containers, the typical refuse generated by workers and small office operations, and other miscellaneous solid wastes.

The treatment of waste materials produced during the eventual decommissioning of the project is discussed in the Decommissioning section of this EA.

Hazardous materials

During the construction phase of this project, there could be spills of potentially hazardous pollutants such as diesel fuel, insulating oils, hydraulic fluid, drilling fluids, lubricants, and solvents. These materials would be used during construction of the facilities or during the refueling and maintenance of equipment and vehicles. Herbicides could be used during construction or operation of the site. These various substances would need to be kept onsite in limited quantities and brought in as required. Spill kits and staff training in the use of these materials would decrease the risk of spills leading to site or water contamination. Batteries used

in vehicles or machinery could also be a source of hazardous materials depending on the type of battery used and would need to be disposed of at appropriate disposal facilities.

In its application, Badger Hollow lists some potential suppliers of the PV panels it could use for the facility. The potential suppliers that they list are: Canadian Solar, First Solar, Hanwha Qcells, JA Solar, Jinko, Longi, Risen, SunPower, and Trina. There have been questions raised regarding the use of cadmium telluride (CdTe) in PV modules due to the concern that cadmium is a heavy metal with known negative health effects if inhaled or consumed. There is less data in scientific literature[42] discussing the human toxicity of CdTe, but it is thought to be less toxic than the individual elements[43]. FirstSolar states that in case of PV module breakage, chemical degradation is unlikely due to the low vapor pressure and low solubility of CdTe. The design of the panels should also prevent the release of this element into the environment, as the layer of CdTe is laminated and between two sheets of glass and adhesive[44]. If panels are broken, or at the end of their useful life, the goal is to recycle materials, rather than placing them in landfill[45]. This would further avoid the potential for any leaching of Cd or Te into soils or groundwater. With the information available, the risk of any heavy metals affecting the environment through the use or correct disposal of CdTe panels is not significant.

Potential Impacts to Community Resources

Land use plans

The future land use in the project area is shown to be predominantly agricultural/open space in the land use plans covering the project area. To the extent that the thousands of acres of land occupied by the solar farm facilities would not be available for agricultural production and would not support the agricultural industry, the solar farm would not be in keeping with the goals of the area's agricultural designation. The solar farm would be an industrial-type facility that is of a different character from the agricultural setting of the project area, as well. That being the case, the sub-arrays would not interfere with farming on adjacent parcels. The land could also be returned to agricultural use after the decommissioning of the solar farm. The electric transmission tie line would not be incompatible with the agricultural designation of the area.

Badger Hollow has stated a desire to work cooperatively with town and county authorities to identify and address issues and concerns, and has discussed zoning and other local issues with county and town elected officials and Iowa County Zoning and Land Use staff. In Iowa County, zoning decision authority is exercised at the county level with input and consultation from the towns. Land in the project area is primarily zoned "Exclusive Agriculture" pursuant to the conditions of Chapter 3 of the Iowa County Zoning Ordinance. Iowa County has a Farmland Preservation ordinance in compliance with Chapter 91 requirements.

The project area is designated a Farmland Preservation Area. The A-1 and AC-1 zoning districts are covered by the Iowa County Farmland Preservation Plan. The majority of the project area is zoned A-1

[42] Brookhaven National Laboratory and US Department of Energy. April 2003. Nomination of CdTe to the National Toxicology Program.
[43] Norwegian Geotechnical Institute. April 2010. Environmental risks regarding the use and final disposal of CdTe PV modules.
[44] Ibid.
[45] Rix et.al. 2015. First Solar's CdTe module technology – performance, life cycle, health and safety impact assessment.

or AC-1. The Red and White Routes would not have an adverse impact on proposed land use in the Town of Eden or the Village of Cobb. The Pink Route also would not have an adverse impact on proposed land use in the Town of Eden or the Village of Montfort.

The Village of Montfort Proposed Land Use Map indicates the undeveloped land on the southernmost parcels within the village boundary west of STH 80 is zoned for industrial development. This zoning area is adjacent to a portion of the Yellow Route. However, with the positioning of the Yellow Route centerline being near the western edge of the STH 80 ROW, it is anticipated the Yellow Route would not have an adverse impact on any future industrial development within this industrially-zoned area of the Village of Montfort.

All project land is zoned A-I Agricultural or AC-1 Agricultural Conservation. All potentially applicable Iowa County requirements on setbacks have been incorporated in the design. In addition, additional setbacks from wetlands and electrical transmission were incorporated into the site layout.

The Iowa County Zoning Map identifies several locations adjacent to the Yellow Route and Pink Route which are zoned as AR-1 Agricultural Residential District. The Iowa County Zoning Map also identifies an AR-1 zoned area north and adjacent to the proposed New Eden Interconnection Substation location.

There would be additional setbacks from fences, trees, roads, etc., that would be required to comply with local zoning and operational requirements of the project.

Landowner impacts

In docket 6630-CE-302,[46] the Commission was made aware during the public hearing process that some landowners had concerns with the number of wind turbines that would be located in close proximity to their residences. In response to those concerns, Commission staff developed an analysis to quantify the number of turbines at various distances from non-participating residences. The results of that analysis were included in the Briefing Memorandum[47] in the docket.

Based on that analysis, the Commission addressed the landowners' concerns in its order authorizing the project, stating:

> Some members of the public submitted written comments regarding the proposed project layout in the proximity of their residences. These comments included statements that there are too many turbines in the area of their homes and that their residences would be surrounded in all four directions if the project is constructed as proposed. Two residences in particular, the Smitses' and the Regneruses', would have 9 and 10 turbines, respectively, within one-half mile of their homes.
>
> The Commission finds that the number of turbines within one-half mile of the Smits' and Regnerus' residences would cause undue individual hardships to those residents. As such, WEPCO shall file a plan with the Commission, for

[46] Application of Wisconsin Electric Power Company for a Certificate of Public Convenience and Necessity to Construct a Wind Electric Generation Facility and Associated Electric Facilities, to be Located in the Towns of Randolph and Scott, Columbia County, Wisconsin, 2010.
[47] PSC REF#: 124326 at 34-36

> Commission approval prior to construction, to reduce the individual hardships to these residents. The plan shall be developed in consultation with the Smitses and Regneruses. The plan may include, but is not limited to: relocation of turbines to reduce the number of turbines within one-half mile to no more than seven turbines; providing annual payments to these two families, not to exceed the amount paid to participating residents receiving payment for one turbine lease; or, purchasing the properties at fair market value. (PSC REF#: 126124 at 36-37.)

In anticipation of similar concerns for the proposed project, Commission staff developed a similar analysis appropriate for solar developments. The analysis sums, in acres, the fenced-in areas associated with the proposed project within one-quarter, one-third, and one-half mile of non-participating residences. The calculations used for each column are explained near the top of the summary, and are divided into two groups: fenced-in area within the stated distances; and, fenced-in area within the same distances weighted, or normalized, to a common distance. The former group provides the raw data for the latter group of columns, and the latter group is intended to represent methods of weighting fenced-in areas based on distance from a non-participating residence. In other words, those fenced-in areas that are closer to a residence are given greater weight than those that are further away.

Specifically, two methods of weighting are used: one on the basis of area; and, one on the basis of distance. Similarly, two methods are used for the area considered: the full fenced-in area within each distance; and, the incremental fenced-in area between distances. The two weighting and two area methods are used in various combinations for a total of four analyses, each with differing results.

The results of this analysis are included in Appendix A. The highlighted values are intended to identify the potentially most affected residences, as follows:

- Yellow – First quartile of values in the column
- Pink – Values above 35 percent
- Purple – Values that rank in the top 10 of most fenced-in acres, normalized fully to one-quarter mile on the basis of area
- Green – Values that rank in the top 10 of most fenced-in acres, normalized fully to one-quarter mile on the basis of distance
- Blue – Values that rank in the top 10 of most fenced-in acres, normalized incrementally to one-quarter mile on the basis of area
- Brown – Values that rank in the top 10 of most fenced-in acres, normalized incrementally to one-quarter mile on the basis of distance

The Commission could consider including in any order authorizing the proposed project a condition requiring the applicant to submit a plan to address landowner concerns regarding the proximity of solar facilities to their residences. The condition could identify the residences to be addressed based on this analysis and any other criteria deemed appropriate by the Commission.

Community agreements

Badger Hollow has not yet completed negotiations with local governments on a possible Joint Development Agreement (JDA), and anticipates that a JDA would include agreement on subjects such as:

- Materials delivery haul routes
- Driveway permits
- Road maintenance and repair
- Stormwater management
- Reimbursement of town or county costs
- Replacement of lost tax receipts for K–12 school district, Technical College ambulance service or fire departments which do not receive Utility Aid Shared Revenue funds.
- State Utility Aid Shared Revenue payments to hold harmless for county and municipal governments
- Decommissioning
- Construction period public safety and EMS service
- Site lighting
- Insurance issues
- Dispute resolution process

Badger Hollow had previously sought a conditional use permit from Iowa County. An application had been submitted to the planning and zoning commission in Iowa County. In Neil Palmer's testimony on behalf of Badger Hollow, Mr. Palmer states that the Iowa County Corporation Counsel recently prepared a legal opinion that recommends against consideration of a conditional use permit in deference to Commission jurisdiction over generating facilities over 99 megawatts. This opinion was accepted by the Iowa County board of supervisors.

Local jobs

There would be a short-term influx of contractor employees during the construction of the project. Badger Hollow provided an Economic Impact and Land Use Analysis report as part of its application,[48] which is Appendix M of the application. The communities near the project are expected to experience short-term positive economic impacts during this construction phase as the employees use various local businesses for food, lodging, supplies, and fuel. Local vendors may also benefit from sales of some materials such as fuel, concrete, and aggregate materials.

The project construction workforce would consist of craftworkers and electricians, along with onsite management personnel. The project's contractor may use a traveling workforce for tasks that are self-performed. During peak construction periods, 500 workers are anticipated. The target local (Iowa County) labor workforce for the project is 25 percent. There are only a limited number of employees in the construction sector in Iowa County.

[48] PSC REF#: 349494

Badger Hollow expects the facility would employ five permanent employees and have additional office space for traveling engineers that would be onsite infrequently.

Shared revenue

Solar PV projects in Wisconsin would increase the tax base for the county and township in which they are located, through the shared revenue utility aid fund. This funding creates a new revenue source for county, village, and township government services.

Badger Hollow estimated the shared revenue utility aid tax implications of the Badger Hollow Solar Farm. Several important assumptions were made. First, the analysis assumes that the project has a capacity of 300 MW for taxing purposes. Second, the projections use the MW based payment and incentive payment formulas in the "Wisconsin Shared Revenue Utility Aid Summary" developed by the Wisconsin Department of Revenue.

According to its estimate, the townships would receive approximately $500,000 annually from the Badger Hollow Solar Farm, and Iowa County would receive over $700,000 annually.

The allocation of the payments amongst the towns and village would be determined by operating capacity in each, and is difficult to estimate before a final sub-array layout is determined.

Using the percentage of leased land in each township and village as a proxy, each would receive the following approximate amounts:

- Mifflin: $298,000
- Eden: $181,000
- Linden: $20,000
- Cobb: $2,000

Local road, rail, and air traffic

Road Use and Traffic Impacts

Traffic would increase on project area roads during the construction of the project as workers arrive and leave the site, deliveries are made, and large machinery travels to the work area. Badger Hollow estimates that there would be between 25 and 35 trucks used daily for equipment delivery during construction. Light duty trucks would also be used on a daily basis for transportation of construction workers to and from the site. During peak construction periods, 500 workers are anticipated.

The main haul route for construction materials would be on USH 18 and STH 80. County and township roads within the project area would be used to deliver equipment and materials to the laydown area and directly to construction sites. The heavy equipment for the substation would likely be delivered directly to the substation via USH 18, STH 80, CTH B, and Drinkwater Road. Applicable permits would be obtained for the final route prior to delivery.

Construction traffic in any given area would occur in a cycle of heavy hauling activities followed by much more numerous but lighter weight vehicles for personnel. The initial phase of heavy hauling would be to deliver earth-moving equipment and then aggregate for solar array access roads. After the access roads are installed, the steel posts would be delivered along with

equipment and personnel for installation, then steel racks and personnel to install them, then solar modules and their associated installation personnel, then the electrical system and its installation personnel.

Heavy hauling activities can be done primarily during daylight hours and on weekdays, but the smaller vehicles for personnel arriving on-site may continue through later hours if needed to maintain the project's construction schedule.

Other than delivery vehicles for the main step-up transformers in the Project Substation, Badger Hollow believes all of the vehicles using local roads would be legal loads in terms of size and weight. If there becomes a need for a larger vehicle, Badger Hollow's construction contractor would work with state and local authorities to obtain the applicable oversize/overweight permits.

Solar projects do not require the large volume of concrete trucks, large mobile cranes, or extreme oversized vehicles that are common for wind projects. Typical construction and delivery vehicles such as dump trucks (e.g. for aggregate delivery), and flat beds and enclosed tractor-trailers for equipment and material deliveries would constitute the majority of project materials delivery traffic. A small number of oversized/overweight deliveries would likely be required for larger electrical equipment and transmission line structures.

Badger Hollow does not expect to see road damage during the construction phase of the project. Repair of road damage is a subject covered in the Joint Development Agreements with the affected local governments.

Railroads

The project would not cross any railroads, and the proposed project is not expected to create impacts to railroads or rail traffic.

Air Traffic

Iowa County Airport is the closest public airport to the proposed project, located approximately five miles from the project area. Badger Hollow provided information in its application related to potential impacts to the airport from both the generating facility and tie line. Badger Hollow provided a report that evaluated whether glint or glare could affect pilots using the Iowa County Airport. This report[49] summarized the results of the use of "Solar Glare Hazard Analysis Tool" (SGHAT) in evaluating the proposed project. It found no significant risk of glint or glare to pilots using the runways of that airport and no air traffic controllers working at the airport to potentially be impacted.

Badger Hollow used the Federal Aviation Administration (FAA) Notice Criteria Tool to determine if pole heights along any of the proposed tie line routes would be limited based on proximity to the Iowa County Airport. The tool was used to evaluate key locations along each route, including two corner pole locations on the proposed red route and white route common segment closest to Northwest Runway 29 at the airport.

[49] PSC REF#: 343646 Provided as Appendix Q of the application.

No evaluated points exceeded the notice criteria when modeled with 100 foot pole heights with one exception: A proposed corner pole location along the proposed red route and white route segments exceeded the FAA notice criteria when modeled over 60 feet in height, and a proposed pole at the project substation location exceeded the notice criteria if over 85 feet in height. All other simulations passed at 100 feet. If any poles or communication towers would be designed that would meet these criteria at these locations, Badger Hollow would submit a Notice of Proposed Construction and an aeronautical study would be performed by the FAA. Badger Hollow would obtain a FAA Determination of No-Hazard (DNH) for any applicable structures.

Both the solar generation site and the proposed tie line location are outside the distance from a local airport or heliport where notice to the FAA is required, unless the possible pole designs previously described would occur. It is not anticipated that the solar facility or tie line would impact aircraft safety due to project structure heights.

Municipal Services and Local Government Impacts

Public services in the form of fire departments, law enforcement, and emergency services are provided by the state, counties, and municipalities where the project would be located. The project O&M building would have a physical address that emergency services could use to respond to a call. Normal local fire and EMS service would be relied upon during construction and during facility operation. Cooperation and training meetings with local emergency service providers would be organized and held. During operation, the facility would obtain potable water from an onsite well and sanitation disposal under County permitting at the Operations and Maintenance Building site.

Photovoltaic generating panels and related facilities do not present unique or unusual fire or other safety hazards. Site facilities do not include difficult elevation or facility access situations. Fire and EMS provider cooperation and periodic meetings would be held to maintain familiarity with site facilities. If Badger Hollow adds a Battery Energy Storage System, fire and EMS personnel would be trained on any special requirements of the system.

One part of the Wisconsin's shared revenue program distributes money annually to municipal and county governments for land used by public utilities. Public utilities are exempt from local taxation, but shared revenue monies are paid to compensate local governments for costs they incur in providing services to the public utility. In this case, under Wis. Stat. § 79.04(6), shared revenue to Iowa County and the towns of Mifflin, Eden, and Linden would be tied to the MW capacity of the new solar generation facility. This shared revenue program would not apply to nearby municipal areas where the generation facilities were not constructed.

Communication Towers

Badger Hollow had a contractor (Comsearch, Inc.) perform a search and provide documentation of communications towers, structures, and communications equipment adjacent to the Badger Hollow Solar Farm and generator tie line projects. Comsearch found four communications towers in the Badger Hollow Solar Farm project area, three of which are near the proposed tie line routes.

Two communication towers are located on the west side of STH 80, near the Pink and Yellow Routes. One of these communication towers, located 600 feet northwest of the intersection of STH 80 and CTH B is used for AM/FM radio transmission. The AM/FM communication tower is supported by a set of steel guy wires that extend close to the highway ROW. The second communications tower along STH 80 is a cell tower located 0.6 mile north of the intersection of STH 80 and CTH B and approximately 300 feet from the highway centerline.

Another communication tower owned by the Montfort Rescue Squad is located 100 feet west of the Pink Route, immediately adjacent to and south of the Eden Substation.

The closest communication tower to the Red Route and White Route is located 0.75 mile east of the proposed Red/White common segment centerline, along USH 18/STH 80 in the Village of Cobb.

Comsearch analyzed AM and FM radio broadcast stations whose service could potentially be affected by the project. No recommendation for mitigation is necessary for the Badger Hollow Solar Farm, as the location of the solar arrays meets or exceeds the required distance separation from all licensed AM and FM broadcast stations near the project area.

Comsearch recommends that there should be an effective quality control maintenance program in effect for the life of the tie line in order to prevent corona and arcing that could cause noise and interference, especially to AM radio. With regard to the FM station, WJTY, it was shown that there could be a potential for antenna radiation pattern distortion if new transmission lines and support structures are constructed on the west side of STH 80. Currently, there are existing transmission lines and support structures on the east side of STH 80 that remain outside the near-field of the FM antenna. Therefore, Comsearch recommends that any new transmission lines and support structures should be constructed on the same side of STH 80 as the existing transmission lines to prevent any nearfield distortion to the nearby antenna. If Badger Hollow must site transmission lines on the west side of STH 80, they should contact WJTY to discuss potential mitigation options with the station. Mitigation could include non-metallic transmission support structures, spacing of transmission support structures outside of the near field region, and other mutually-agreeable solutions.

Comsearch performed an Over-the-Air (OTA) TV Analysis and concluded that television reception interference was unlikely. Specifically, the inverters of a power conversion station should be installed away from residential areas to reduce the likelihood of EMI to households that may rely on OTA television service. At minimum, a setback distance of 500 feet from any household is recommended. In the unlikely event that EMI is observed at a certain household following the construction of the solar farm and tie line, a high-gain directional antenna may be employed, preferably outdoors, and oriented towards the signal origin to mitigate the potential impact on OTA TV signal reception.

An assessment of the emergency services in the project area was performed by Comsearch to identify potential impact from the proposed solar farm. Comsearch evaluated the registered frequencies for the following types of first responder entities: police, fire, emergency medical services, emergency management, hospitals, public works, transportation and other state, county,

and municipal agencies. Comsearch also identified all industrial and business land mobile radio systems and commercial E911 operators in proximity of the solar farm project. The proposed project is not expected to cause any significant degradation in signal strength after construction. In the event that a public safety entity believes its coverage has been compromised by the presence of the transmission line, it has many options to improve its signal coverage to the area through optimization of a nearby base station or by even adding a repeater site. If necessary, the transmission line towers themselves can serve as the platform for a base station or repeater site.

For the cellular towers located within the project area, no setback distance is required from an interference standpoint due to the higher frequencies in which they operate within the ultra high frequency (UHF) band. Electromagnetic interference (EMI) from a solar farm is caused by an induction field, which is created by the AC electrical power and harmonics at the inverter of the Power Conversion Stations located throughout the facility. The propagation of the interference occurs over very short distances which are generally around 500 feet or less, and due to the low frequency (60 Hertz (Hz)) operation of the PV inverter, EMI from solar farms does not normally extend above 1 MHz.

In the unlikely event that a mobile phone carrier believes that its coverage has been compromised by the presence of a power transmission line, it has several options to improve the signal coverage to the area through optimization of a nearby base station transmitter or by adding a new sector or cell site. Various structures, including utility poles or transmission line towers themselves, can serve as the platform for a new base station, small cell, or repeater.

Both cable service and direct broadcast satellite service would be unaffected by the presence of the solar farm and may be offered to those residents who can show that their Over-the-Air TV reception has been disrupted by the presence of the solar farm or tie line after they are constructed.

Noise

It is expected that for the Badger Hollow project the vast majority of project noise would be experienced during the construction phase, and, to a much lesser extent, during the operation of the facility, coming mostly from the inverters, tracking motors, and transformers. Impacts associated with noise can be subjective and vary from person to person, based on factors such as loudness, time of day, frequency, or duration, and the amount of other background noise audible to the listener.

Construction noise would come from a series of intermittent sources, most of which would be diesel engine construction equipment. Because of the unique nature of large-scale solar projects, construction would be spread over a large area. Construction noise impacts would vary significantly with time of day, stage of construction, and panel locations. Construction of access roads and project facilities would include the use of typical construction equipment such as bulldozers, graders, excavators, trucks, vibratory post setters, and cranes. Construction would occur primarily during daytime hours, so there would be little or no construction noise impact at night. The types of noise generated by construction of the solar farm are not expected to be significantly different from noises associated with other common outdoor construction activities.

During operation of the solar farm, the primary source of noise would be the inverters, and to a lesser extent, the transformers and the rotation of the tracking systems at each facility. Because the facilities would not be generating electricity at night, the tracking systems would not be rotating and noise from inverters would less than peak levels.

In previous wind generation facility projects, the Commission has typically required that a post-construction noise survey be prepared as a condition of approval of the project. A similar post-construction noise survey would likely be required of this project to confirm noise impact assumptions.

Noise Measurements

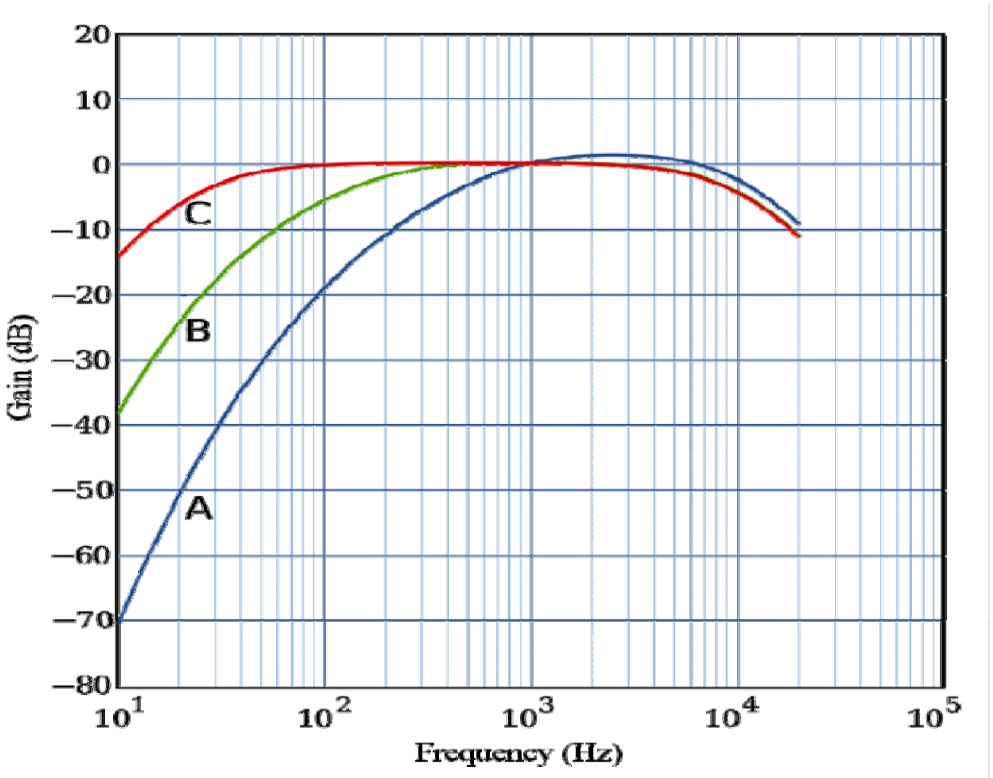
Everyday sounds are comprised of sound waves of many different frequencies. The frequency of a sound wave is measured in Hz, with one Hz equal to one sound wave cycle per second. Sound levels are measured with a device called a sound level meter in units known as decibels (dB).

While the frequency range of human hearing is generally accepted to be between 20 to 20,000 Hz, the human ear is not equally sensitive to sounds through that entire range. Accordingly, when sound level measurements are taken, it is customary to use weighting curves in conjunction with the sound level meter to approximate the frequency sensitivity of human hearing. Three internationally standardized weighting characteristic curves exist for sound measurements: characteristic A for sound levels below about 55 dB, characteristic B for sound levels between about 55 and 85 dB, and characteristic C for sound levels above about 85 dB.[50] In practice, the B weighting characteristic curve is rarely used. A graphical representation of these weighting curves is included in Figure 5. When sound levels are measured using a weighting characteristic, the measurements are designated by adding the characteristic curve letter after the abbreviation for decibels, such as 58 dBA.

In some instances, sound level measurements are taken without weighting. Those sound levels are typically expressed in dB, and are referred to as unweighted sound levels.

[50] Beckwith and Buck, Mechanical Measurements, Second Edition, 1969.

Figure 5 **Sound level frequency weighting curves**



Common Sound Levels

Sound levels above 140 dBA can cause immediate damage to hearing. At the other end of the spectrum, normal breathing generates a sound of about 10 dBA while a soft whisper registers at around 30 dBA. Normal conversation would be about 60 dBA at a distance of three feet. People are exposed to a wide variety of noise levels in their living environment. Typical ambient noise levels in an urban environment can range from 58 dBA for a quiet urban area to as much as 72 dBA or more for very noisy neighborhoods. For small towns and quiet suburbs, ambient noise levels typically range from 47 to 53 dBA. Rural areas are even quieter, with noise levels during the daytime hours of around 45 dBA. In the workplace, a medium-sized office would exhibit, on average, a noise environment of around 63 dBA. Inside a typical residence, daytime noise levels can vary from 40 to 45 dBA with no television or radio playing, to between 50 and 70 dBA while listening to television or stereo music.[51,52]

Sound Level Calculations and Human Perception Of Sound

In order to determine the likely impact of a new sound source it is important to understand how new sources of sound add to the ambient environment. Sound levels (as measured in dB) are logarithmic rather than linear. This means that the decibel levels emitted by two different sound sources cannot simply be arithmetically added together to determine the combined effect of those

[51] Environmental Protection Agency, 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.
[52] Talbott, E.O. and G.F Craun, 1995. Introduction to Environmental Epidemiology. Lewis Publishers.

sound sources. As a generally accepted rule of thumb, two noise sources emitting sound at the same dB level would have a combined total sound level of 3 dB greater than either source alone. The same rule can be applied to weighted sound levels.

As a point of reference, sound experts generally agree that the human ear can detect changes in dBA roughly as follows:

- A change of 3 dBA or less is barely perceptible.
- A change of 5 dBA is perceptible.
- A change of 10 dBA is perceived as either twice or half as loud.

Sound levels decrease with distance from the source. Assuming there are no obstructions between the sound source and receptor, the sound from a single point source decreases by approximately 6 dBA for every doubling of the distance. For a sound source that is a continuous line, such as a highway, the sound levels will generally decrease by about 3 dBA with a doubling of the distance from the source. In addition to distance, sound levels can be affected by intervening structures or objects such as buildings, trees, and shrubs.

Sound level reporting

When sound level measurements are taken over a period of time, the overall sound level is expressed as L_{eq}. This quantity can be thought of as the equivalent or average sound level over the period of the measurement, and may be expressed in dBA, dBC, or unweighted dB.

In addition to L_{eq}, a number of statistical sound level measures are commonly used to characterize noise environments. One of the more important of these statistical measures is L_{90} noise levels in both dBA and dBC. The L_{90} is the sound level that is exceeded 90 percent of the time, and is generally accepted to represent the sound that is nearly always present in a given noise environment, as it reduces the influence on the measurements of short-duration, transient noises such as automobile drive-bys and aircraft fly-overs. Some other statistical measures commonly used include L_{10} and L_{50}, which represent the sound levels exceeded 10 and 50 percent of the time, respectively.

Octave band measurements are often used to characterize sounds over the frequency range. These measurements quantify the sound level in specific frequency ranges, which are typically centered at 16, 32, 63, 125, 250, 500, 1000, 2000, 4000, and 8000 Hz. One-third octave band measurements are sometimes used, where there would be three measurements in each octave at various center frequencies. Octave band measurements can be reported in dBA, dBC, or dB, and in any of the statistical measures.

Because of the differences in the A-weighted and C-weighted characteristic curves, subtracting the dBA measurement from the dBC measurement yields a generally accepted estimate of the low-frequency component of the sound. Referring to Figure 5, the difference between the L_{eq} in dBA and the L_{eq} in dBC would result in a numerical representation of the area under the C-weighting curve that does not also lie under the A-weighting curve.

Noise level standards

Acceptability standards for noise vary by nation, state, and locality. In the U.S., the EPA only provides noise guidelines, not standards. Some state governments issue their own regulations and local governments often enact noise ordinances. There are no statewide noise standards for solar developments

in Wisconsin. Iowa County's zoning ordinance contains 50 dBA nighttime limits for wind turbines, in accordance with PSC 128.105(1). Noise emissions from Badger Hollow would be expected to meet this standard. A copy of the Iowa County noise ordinance is included in Appendix HH of the application. This ordinance refers to the operation of motor vehicles only. The Iowa County Wind Energy Siting Ordinance is also included in Appendix HH.

PSC Noise Measurement Protocol requirements

Badger Hollow hired a consultant to conduct a noise study as required by the PSC Measurement Protocol for Sound and Vibration Assessment of Proposed and Existing Electric Power Plants (Noise Protocol).[53] This protocol is part of the PSC's application filing requirements for electric power plant developers.[54] In summary, the Noise Protocol requires the applicant or its consultant to take a series of ten-minute sound level measurements in the project area prior to construction to establish the nature of the pre-construction noise environment. These measurements are required to be taken during various periods during the day, at each of several measurement point (MP) locations agreed upon between Commission staff and the applicant. The required measurement periods are as follows:

Table 3 Required noise measurement periods

Measurement Period	Military Time	Time Period
Morning	0600-0800	6:00 a.m. to 8:00 a.m.
Afternoon	1200-1400	Noon to 2:00 p.m.
Evening	1800-2000	6:00 p.m. to 8:00 p.m.
Night	2200-2400	10:00 p.m. to Midnight

MP locations are selected to provide information on the range of noise environments in a project area. Some examples of areas commonly selected for measurements include: areas with residences, areas with industrial noises, quiet areas, and public areas.

Required pre-construction measurements at all locations include L_{eq}, and statistical measures of L_{10}, L_{50}, and L_{90}, all in both dBA and dBC. In addition, unweighted octave band measurements are required at each MP during each time period, down to center frequencies of at least 16 Hz. The applicant is required to provide estimates of the increase in sound levels during each measurement period and at each location using sound data provided by the solar generating equipment manufacturers.

Finally, the applicant is required to provide a sound level contour map showing the anticipated sound levels from the proposed project. The sound levels shown on this map, in conjunction with measurements of existing sound levels, are used to estimate the increase in sound levels in the project area.

If the project is approved, the applicant is usually required by the Commission's order to collect post-construction noise measurements in accordance with the Noise Protocol. These

[53] https://psc.wi.gov/SiteAssets/ConventionalNoiseProtocol.pdf
[54] https://psc.wi.gov/SiteAssets/2017PowerPlantAFR.pdf

measurements are taken at the same MPs and during the same time periods as the pre-construction measurements. Two sets of measurements are required: one with the solar facility operating; and one with the solar facility not operating.

Pre-Construction noise study results

A pre-construction noise analysis was conducted for Badger Hollow by Hankard Environmental. The analysis consisted of determining the location of all noise-sensitive receptors located near the project, measuring existing noise levels within the project study area, and predicting both construction and operational noise levels at noise-sensitive receptors. Noise levels from the operation of the project were also compared to the Commission's 45 dBA standard for wind turbine power plants. For more detailed information, refer to the Pre-Construction Noise Analysis for the Proposed Badger Hollow Solar Farm, Appendix P of the application.

Noise-producing elements of the operation of the project would include inverters, tracking motors, and transformers. The project layout studied for this analysis consists of 125 inverters and approximately 3,150 tracking motors, which would be located throughout the project. These components would provide for an up to 375 MW project, though Badger Hollow is only requesting approval for 300 MW. The project layout version studied for this analysis conservatively used all 375 MW, including 25 percent surplus inverters and tracking motors, though only 300 MW would be built, at most. The two transformers would be located at the project's substation near the middle of the project.

Noise-sensitive receptors in the area include mainly single-family residences, as well as one school. One hundred and six residences were specifically identified for this analysis, as well as the school located at the intersection of Iowa-Grant Road and CTH XX. The closest of these residences have proposed solar panels within approximately 200 to 300 feet. Most residences are located thousands of feet from any of the project's noise-producing components.

An ambient noise survey was conducted in the project area between April 30 and May 4, 2018. Noise levels were measured at six locations that were selected following consultation with Commission staff. Hand-held measurements were collected during four different time periods on two different days, for a total of 48 (6 locations x 4 time periods x 2 days) individual measurements. In addition, noise monitors were left at two locations to continually measure ambient noise levels over the course of four days and nights. Sources of existing noise in the area were primarily natural sounds such as birds, frogs, and wind. Other sources included ventilation fans and other noise from farms, tractors working in the fields, distant traffic (USH 18, STH 80, and county roads), and local traffic (very sparse). The existing wind turbines to the north were barely, if at all, audible.

Measured daytime noise levels range from approximately 30 to 50 dBA. Measured nighttime noise levels range from approximately 30 to 40 dBA. The noise levels measured by the long-term monitors are consistent with these ranges, but also captured slightly higher noise levels during the day (up to 68 dBA) and lower noise levels at night (down to 20 dBA).

Predicted construction noise level of the solar facility

Noise levels during construction of the proposed project were predicted using the Federal Highway Administration's Roadway Construction Noise Model (v 1.1). Noise levels were predicted for four phases of construction: site preparation, civil work (grading, etc.), mechanical assembly, and electrical assembly. Noise from construction would vary greatly at any one receptor and would depend on the type of equipment used and how far away it is being operated. A typical bulldozer has a noise level of 70 dBA at a distance of 250 feet (the closest equipment would get to residences). When working near a residence, noise levels could get this high. If two equally-loud bulldozers were present, noise levels would increase to 73 dBA. As equipment moves further from a residence, noise levels would decrease. For example, when a single bulldozer moves from 250 feet to 1,000 feet, the noise level drops below 60 dBA.

The analysis demonstrates that noise levels at the nearest residences to the project would reach a high of 60 to 70 dBA during the site clearing and grading phases when equipment would be operating directly adjacent to a given residence. Noise levels would be similar during the mechanical installation phase of construction when vibratory pile driving would be taking place nearby but would otherwise be lower (50 to 60 dBA). Noise would be minimal during the electrical finishing stage. It is important to understand that the above-described levels would only occur on those days when construction activities are taking place adjacent to a residence. Noise levels would decrease when construction is more distant, during times when noise-producing equipment is at idle, and during times when no construction is taking place near the residence or at the site at all.

Predicted post-construction noise level from an operating solar facility

Noise levels from the full operation of the proposed project were predicted at each noise sensitive receptor. Noise levels were predicted using the methods specified by International Standards Organization (ISO) 9613-2, *Attenuation of Sound During Propagation Outdoors - Part 2: General method of calculation*. Noise emission levels for the inverters, tracking motors, and transformer were determined from manufacturers' data, and from other published measurement results and reports. The ISO method was implemented using the SoundPlan software program. A ground factor of 0.5 was assumed, which is representative of farmland. Operational noise levels range from less than 20 dBA at more distant receptors, to a high of 40 dBA at the closest non-participating receptor. All of the levels are significantly less than the Commission 45 dBA standard for wind turbines. Also, Badger Hollow states that this level would only be reached during the daytime on sunny days. Under cloudy conditions noise levels would be at least 3 dBA lower, and no detectable noise would be emitted by the project at night.

Noise from the operation of the facility would be inaudible much of the time due to higher levels of ambient noise, particularly on windy days. Existing daytime noise levels range from 35 to 55 dBA and would mask noise from the project completely at all of the more distant receptors. At the closest receptors, those with predicted levels from the facility of 35 dBA or more, the facility may be just audible when it is sunny and not windy. The facility would not be audible at any receptors when it is windy.

Post-construction noise complaints

If the project is approved, the applicant may be required by the Commission's order to collect post-construction noise measurements in accordance with the Noise Protocol. These measurements are taken at the same MPs and during the same time periods as the pre-construction measurements. Two sets of measurements are required: one with the project in operation, and one where the facility would not be operating.

Glint or Glare

Reflected sunlight from the surfaces of the PV panels, commonly referred to as glint or glare, has been identified as a potential concern. The most likely time of the day for glint or glare to affect residences and other buildings is either early in the morning or later in the evening, when the sun is lower in the sky. As part of the effort to evaluate the concern, Badger Hollow had modeling performed that explored the possibility of glare impacting areas in the vicinity of the project. As reported in Appendix Q of the application,[55] Badger Hollow's contractor who performed the glare study concluded that there was not a strong potential for glare to cause significant problems for possibly affected residences.

Specifically, the study identified 28 key observation points (KOP) in the project area for further modeling. These KOPs were believed to be spatially representative of the area, meaning that the results of the study should be able to be extended to the whole project. All KOPs were taken to be within 0.5 mile of the project footprint. Each of these residences were then incorporated into modeling software that investigates the possibility of glint or glare at each site. The preliminary study indicated that 23 of the 28 chosen sites could have potential glint or glare impacts. Potential impacts were also considered for the nearby Iowa County Airport and associated runways.

Once the modeling identified the areas that could have potential for glint or glare, an assessment was performed to check for the possibility of permanent eye damage at any of the KOPs. For the residential KOPs, no possibility of permanent eye damage was identified by the model. Based on positions of the panels, residences, and angles of the sun, the modelling indicated that, at most, a temporary after-image would be the strongest outcome from any glare for the PVs modeled. Similarly, only one runway at the Iowa County Airport was identified to have a low potential for glare causing a temporary after image upon seeing glare from the PV panels.

In the event of glint or glare that may cause a nuisance at any residences or other locations, Badger Hollow noted that remedial steps to decrease the glare could be pursued. Among other options, Badger Hollow established that it could plant additional vegetation, implement fencing or other visual obstructions, or use anti-reflective coatings on some panels. Badger Hollow described a process that it could use to resolve possible inquiries or complaints, including further modeling to establish specific times of concern for individual locations and implementation of some of the remedies described earlier.

[55] PSC REF#: 349499

Views, Aesthetics, and Lighting

The PV subarrays would cause the greatest visual impact of the proposed project facilities. The many acres covered and the industrial appearance of the panels would be a dramatic change from the existing views of agricultural fields. The subarrays nearest USH 18 would be the most visible, due to the numerous travelers on the highway. The rolling nature of the terrain would block distant views of some subarrays from some locations.

The solar arrays would cover many acres, imparting an industrial appearance to the project area. Because of the rolling nature of the topography, the arrays could be visible over considerable distances. Sunlight reflections at certain times of the day could be noticeable and distracting at times, particularly when the sun is at a low angle in the sky. Badger Hollow would consider planting vegetative screens to block the views of some landowners. Any screening would be less effective at first, before the vegetation has grown sufficiently to provide significant screening.

Using an eight-foot tall woven wire "deer fence" without barbed wire instead of a chain link fence topped with barbed wire could improve the aesthetics of the subarrays by imparting a less industrial, prison-like appearance to the facilities.

Agricultural Land Impacts

As an Independent Power Producer, Badger Hollow does not have condemnation rights and therefore is exempt from the Agricultural Impact Statement (AIS) statute.

Some of the greatest impacts of the project would be to agriculture. Overall, land cover and land use within the project area is dominated by agriculture, primarily corn and soybean row crop production, with some pasture land. The project would take many acres of cropland out of agricultural production for the life of the project, which could be 50 years or more. Areas within the proposed fenced sub-arrays contain 1,832 acres of cropland, with access roads outside the fenced sub-arrays requiring another 1.76 acres. Hay or pasture land occupy 778 acres within the sub-arrays. Access roads account for an additional 0.39 acre. Badger Hollow is considering allowing grazing by sheep or goats within the fenced sub-arrays.

Nearly 80 percent of the land proposed for sub-arrays (areas within the fences), totaling 2,141 acres, is classified as having prime farmland soils. These are the lands best suited for food and fiber production.

For the transmission line tie line, approximately 61 percent of the Red Route passes through row crop fields and nine percent passes through hay fields or pasture. The ROW would contain 20.1 acres of cropland and 2.8 acres of pasture.

Approximately 69 percent of the White Route passes through row crop fields, and 8.5 percent passes through hay fields or pasture. The ROW would contain 22.7 acres of cropland and 2.8 acres of pasture.

Approximately, 61 percent of the Pink Route passes through row crop fields, and 24 percent passes through hay fields or pasture. Where the route follows road ROW, poles would be placed outside of farm fields. The ROW would contain 23.1 acres of cropland and 9.1 acres of pasture.

Approximately 54 percent of the Yellow Route passes through row crop fields and 26 percent passes through hay fields or pastures. Where the route follows road ROW, poles would be placed outside of farm fields. The ROW would contain 17.0 acres of cropland and 7.0 acres of pasture.

Up to 55 miles of underground electric collection lines would be required for the project. No overhead collection lines are proposed. Depending on the final design, approximately 15 collector circuits are expected to be needed to connect the solar arrays to the project collector substation. The medium voltage cables would be direct buried in native soil with 48 inches of cover in a 12 inch wide trench. Parallel trenches would be separated by 15 feet. Collection lines would be buried deeply enough so that they would not interfere with the tilling of cropland.

Badger Hollow has secured an option to purchase 10 acres for the O&M building and project substation. This area is currently the site of a dairy operation. The operator would retire the operation if the project is approved.

The project construction contractor would develop up to 50-acres of temporary construction mobilization and laydown area across one or multiple sites within the project boundary that would include temporary construction trailers with administrative offices, construction worker parking, temporary water service, and temporary construction power services, tool sheds and containers, as well as a laydown area for construction equipment and material delivery and storage. These areas could be located on cropland or pasture, which would remove them from production, until they are restored following construction.

There are no known irrigation systems, drainage tile systems, aerial seeding or spraying operations, or organic farms along the transmission line tie routes that would be affected by the project. As the White Route travels north from Tower Road, it is adjacent to a tree-line which may serve as a wind break. Badger Hollow has obtained voluntary transmission easement agreements with all landowners involved on the Red and White routes, and the landowners are satisfied that the proposed routes would not adversely affect their current agricultural practices. Where the Pink and Yellow Routes would be located adjacent to public roads, the poles would be located outside of farm fields, reducing impacts to farm operations on adjacent lands. Should any drainage tiles be damaged by construction, Badger Hollow could repair them after construction is completed.

Due to the prevalence of well-draining soils in the area, there is a limited quantity of drain tile within the project area. Badger Hollow knows of only one drain tile location, which is in a grass waterway within a tie line easement. The project would require an access road and one underground collection circuit in the easement area. Badger Hollow believes it can avoid impacting the drain tile, but would agree to work with the landowner to repair the drain tile promptly after construction, if avoidance is not possible.

The substation and O&M building would be located on land currently occupied by an operating dairy farm. The land is privately owned, and Badger Hollow has an option to purchase up to 10 acres of the property. Prior to construction, the land would be purchased and dairy farming activities would cease. The remainder of the property and an adjacent field totaling

approximately 286 acres are subject to a solar lease and easement agreement with Badger Hollow. A New Eden Substation would occupy 1.41 acres of grassland with prime soils.

The entire tie line ROW would be cleared of vegetation to allow for the construction of the new transmission tie line. Construction vehicle traffic in the transmission line ROW or along off-ROW construction access routes has the potential to impact agricultural lands. Potential construction related impacts on agriculture would generally be short term in nature, and could consist of crop losses, soil mixing, and/or soil compaction along equipment access routes and around structure installation sites. Badger Hollow could mitigate these short term impacts by providing compensation to the property owner or renter for crop loss, and/or by restoring agricultural lands to pre-construction conditions, as required under Wis. Stat. § 182.017(7). Where appropriate, mitigation techniques such as deep tilling could be utilized to restore soil tilth.

Excess/excavated soil would only be spread within the project area in accordance with terms of the solar lease agreements with landowners. Spreading subsoil on cropland/pasture would be avoided to the maximum extent practical. Subsoils are less productive than topsoil.

Badger Hollow could further minimize transmission line construction impacts on agricultural lands by using one or more of the following techniques: completing construction during dry or frozen conditions; using equipment with low ground pressure tires or tracks; placing construction matting to help minimize soil and vegetation disturbance, and distribute axle loads over a larger surface area to reduce the bearing pressure on agricultural soils; or using ice roads.

Herbicide may be used selectively during the establishment of ground cover. Once established, herbicide use would likely be infrequent. Minimal use of herbicide would help protect the potential organic status on cropland adjacent to the sub-arrays.

Satellite imagery from Google Earth 2013 and US Department of Agriculture Farm Service Agency National Agriculture Imagery Program (NAIP) 2017 fly-over aerial photography were used by Badger Hollow to determine the number of confined animal dairy operations within one-half mile of the proposed centerline of each route and is summarized below.

In some circumstances, transmission lines can induce stray voltage on nearby electric distribution lines, as well as metal objects (such as fences or irrigation lines), that parallel the transmission line. Satellite imagery from Google Earth 2013 and U.S. Department of Agriculture Farm Service Agency National Agriculture Imagery Program (NAIP) 2017 fly-over aerial photography were used by Badger Hollow to determine the number of confined animal dairy operations within one-half mile of the proposed centerline of each route. The Red and White Routes both have three dairy operations located within one-half mile of their proposed centerlines. The Pink and Yellow Routes both have eight dairy operations located within one-half mile of their proposed centerlines.

The transmission line tie line would be designed and constructed to minimize the potential for induction issues. This might include relocation of electric distribution lines to eliminate physical conflicts with the tie line or increasing separation with the proposed tie line.

Once a route has been selected, Badger Hollow would work with the owners of the dairy and agricultural operations that might be impacted by induction, in order to address their concerns. Stray voltage testing before project construction begins and after the project is completed and generating power could determine if any stray voltage problems have been caused by the project. Stray voltage is not anticipated to result from operation of the solar panels or electric collection lines.

Farmland leased for the project would not be available as rental cropland during the project lifespan, which might drive up rental prices, due to a decreased supply. Because the land would be taken out of agricultural production, there would also be a reduced demand for agricultural products and services in the immediate area, such as seed, fertilizer, and harvesting services.

The predictable annual payments to participating landowners can support continuing agricultural operations on their remaining lands not leased for the project. Some landowners have used the opportunity to retire from farming, relying on the income stream from the project for much of their income.

Badger Hollow claims that farmlands impacted by the project could be returned to agricultural production after decommissioning of the project. When and if the project is decommissioned, the solar panels could be removed, the land tilled to break up the ground cover, and access roads removed and replaced with topsoil.

Using native prairie and savanna species as the primary vegetation cover for the project would improve or maintain soil health. The topsoil present on the project site was originally created over time by deep-rooted perennial native species prior to its conversion to agricultural use. Prairie vegetation can provide superior rainwater infiltration and control, improving the quality of groundwater through filtering, and increasing soil health.

It has been well documented that the use of native prairie and savanna species on the land would result in tangible soil improvements, including significantly reduced topsoil loss through erosion, an increase in soil organic carbon levels, improved soil fertility through increased organic matter, and improved soil moisture and drought resilience. (Kimbal et al. 2009. Soil Carbon Management., CEC press). In addition, a shift in soil microorganisms to a higher fungal/microbial ratio overall is expected to improve the soil structure and stability against erosion.

Accordingly, because of the improvement to soils, Badger Hollow believes it is very likely the cropland would be returned to pre-construction yields or better after 50 years of use as a solar generating facility. Because a solar farm of this size on farmland has never been decommissioned, however, this cannot be known with certainty.

All land leased for the project and connecting transmission line qualifies under the Iowa County Farmland Preservation Ordinance which is compliant with Wisconsin Farmland Preservation law. The tie line would be an allowable use in the Farmland Preservation district. All land leased for the project qualifies under the Iowa County Farmland Preservation Ordinance, which

is compliant with Wisconsin Farmland Preservation law (Chapter 91). The project would be an allowable use in the Farmland Preservation district.

Three participating landowners have portions of their leased properties enrolled in the Conservation Reserve Program (CRP). The final project design would avoid construction in these areas and would be in compliance with CRP contract terms.

In summary, the potential agricultural impacts that could result from the project include cropland removed from production due to construction of the sub-arrays, substations, and transmission line structures, damage to field drainage systems, impacts to efficient tillage due to transmission structure placement, temporary crop damage, and soil compaction. Soil compaction reduces crop yields and may take years to be reversed through natural processes. Transmission line structures could create areas that are difficult or impossible to cultivate. In general, access to structure locations would be along the ROW or from public roadways that parallel or cross the line route, unless alternative access methods that would result in lower impacts are available.

Recreation

Land occupied by the subarrays would be unavailable for hunting. Fencing would keep large animals out of the lands occupied by the subarrays. The vegetative ground cover within the fenced areas could serve as nesting and feeding habitat for birds and small animals.

Property Values

Residents in the project area have expressed concerns that construction of the proposed solar project would reduce their property values due to changes in views, rural character, and land use in the townships. Property values can be influenced by a complex interaction of factors specific to individual parcels. These factors can include, but are not limited to, condition, improvements, acreage, or neighborhood characteristics, as well as proximity to schools, parks, and other amenities. In addition, local and national market conditions often influence property values. The presence of a utility-scale PV facility would become one of many interacting factors that could affect a property's value.

Solar generating facilities have the potential to impact property values. Negative effects from these facilities could be the result of impacts that extend beyond the immediate footprint. Examples could include noise and visual impacts. Unlike fossil-fueled electric generating facilities, however, a PV facility would have no emissions and essentially no noise impacts to adjacent land uses during operation of the facility. The installation of PV facilities would create a visual impact, but lacking the height of smokestacks or wind turbines, the visual impact at ground level, or within a neighboring building, would be more limited. A review of the literature found no research specifically aimed at quantifying impacts to property values based solely on proximity to utility-scale PV facilities. As the industry continues to develop, comparable data should become available. For these reasons, the impact to the value of one particular property based solely on its proximity to a utility-scale PV facility is difficult to determine. Widespread negative impacts to property values are not anticipated. In certain situations it is possible that individual property values could be negatively impacted.

On a long-term basis, improper or incomplete decommissioning of the proposed project could adversely affect local property values. As described earlier in this EA, Badger Hollow has described a decommissioning plan.

EMF

Magnetic field levels have been estimated for each of the possible segments of the proposed generator transmission tie lines. These levels vary from location to location due to differences in current flows, conductor arrangement, and the cancellation effect of fields generated by other nearby electric transmission and distribution lines.

For the Red and White Routes, magnetic field levels at normal load (80 percent of estimated peak, system in normal configuration) are calculated to range from 125 to 166 milliGauss (mG) at the proposed transmission line centerline and range from 74 to 104 mG at 25 feet from the centerline.

For the portions of the Yellow and Pink Routes where there are no existing transmission lines, magnetic field levels at normal load are calculated to range from 123 to 134 mG at the proposed transmission line centerline and range from 35 to 90 mG at 25 feet from the centerline.

For the portion of the Pink Route where there are existing electric lines (two 69 kV and one 12 kV circuits) along CTH B and STH 80, magnetic field levels at normal load are calculated to be 33 mG at the proposed transmission line centerline before construction and range from 24 to 30 mG at 25 feet from the centerline. For the proposed new 138 kV line along this route, the magnetic field level at normal load is calculated to be 92 mG at the proposed transmission line centerline once the solar farm is operating. At 25 feet from the centerline, the field is calculated to range from 53 to 82 mG.

No day care centers, hospitals, or nursing homes are known to exist within 300 feet of any of the proposed route segments.

Evaluation of Reasonable Alternatives and Some of their Economic and Environmental Consequences

No Action Alternative

The no action alternative, which would be a denial of Badger Hollow's application, is a potential outcome of the Commission's consideration of this application. Another no action alternative would have been Badger Hollow choosing not to make the effort to bring this potential project to the Commission in the first place, or that effort falling short prior to filing an application with the Commission. The potential environmental consequences of the proposed project described in this EA would not occur if the Commission denies the application or if Badger Hollow had never filed an application with the Commission.

Alternative Sites for PV subarrays

Badger Hollow has proposed a grouping of subarray sites that could serve as sites for the proposed solar project. These subarray sites provide options from which the Commission could select as allowable areas for the installation of the proposed project. The Commission will account for a wide variety of factors as it reaches its decision about what sites in the proposed project area could be utilized for the installation of solar panels, inverters, and tracking equipment.

Alternative Routes for Transmission Lines

The four currently proposed alternative routes for the electric generator tie line were described earlier. The reason there are four alternatives is to allow for the ongoing MISO study process, which must conclude prior to the determination of a final interconnection point and route.

Other Alternatives

An alternative to the solar PV facility could take the form of other energy generation technologies, such as wind energy systems or natural gas electric generation facilities. Any alternative generation facility would have its own suite of impacts on the human environment, some of which would be similar to those discussed in this EA. Other impacts, such as air quality impacts, would be significantly different if an alternative that utilized fossil fuels was considered.

List of Contacts during EA Preparation

- Geri Rademacher, Wisconsin DNR - Energy Project Liaison, Bureau of Environmental Analysis and Sustainability. Information about wetlands and waterway impacts and permit requirements.
- Stacy Rowe, Wisconsin DNR - Conservation Biologist, Bureau of Environmental Analysis and Sustainability. Assistance with discussion of potential impacts to protected species.

Summary of Comments or Other Information Received During EA Process

Numerous comments were received from members of the public during the EA scoping period. A frequently mentioned concern was the compatibility of the project in an agricultural area and its impact on the rural community and agricultural economy. This concern was expressed in comments about: compliance with local land use plans, diversion of non-prime farmland to non-agricultural use, stray voltage, project scale, possibilities of storm damage, stormwater control, potential soil erosion, possible soil and groundwater contamination, decommissioning plan adequacy, and wildlife impacts. Other potential negative impacts that were cited included noise, glare and other visual impacts, possible health impacts, inadequate setbacks, reductions in residential property values, reduced school tax revenues, and interference with communications signals.

Landowners participating in the project were supportive in their comments. Commenters cited the following benefits of the project: Economic benefits, a steady income source for landowners,

the creation of jobs, the provision of renewable energy, greenhouse gas reduction and air quality improvements as compared to fossil-fueled electric generation, soil health improvement, and provision of pollinator habitat.

Wisconsin Environmental Policy Act Determination

Wisconsin Admin. Code § 4.20(2)(d) identifies ten broad factors that are useful to consider when evaluating whether an EIS is warranted for a given Commission action. The following subsections consider and discuss each of the ten factors with respect to this case.

Effects on geographically important or scarce resources, such as historic resources, scenic or recreational resources, prime farmland, threatened or endangered species, and ecologically important areas

No geographically important or scarce resources were identified within the area to be affected by construction of the proposed project. The proposed project is not expected to significantly affect historic resources, scenic or recreational resources, threatened or endangered species, or ecologically important areas. There would be agricultural land taken out of production, including areas classified as prime farmland, for the duration of the project's operation. When the project is eventually decommissioned, these agricultural areas may again be available for production.

Conflicts with federal, state, or local plans or policies

The large-scale, industrial-like, solar facilities proposed would not be in keeping with the exclusive agricultural designation of the project area in local land use plans. The solar farm is intended to be a long-term non-agricultural land use. The solar facilities would not interfere with farming on adjacent lands. When the project is decommissioned, the project lands could be returned to agricultural use.

Significant controversy associated with the proposed action

Notice of the proposed project was sent to local municipal offices and local media, as well as potentially impacted landowners. As stated above, there were public comments by several landowners and non-landowners regarding concerns they had about the project. The nature and amount of comments received could be considered typical for a project of this type. The relative newness of utility-scale solar proposals in Wisconsin was likely a contributing factor.

Irreversible environmental effects

Few aspects of the proposed project would be truly irreversible, although reversing project actions would incur significant costs and create additional disturbance and environmental effects. Short-term impacts such as noise, air quality, disturbance to local residents, erosion, and removal of vegetation would occur as a result of construction activities, and would not be irreversible. Direct impacts to any wildlife in the project area as a result of construction actions would not be irreversible. Fuels and some construction materials would be irreversibly committed and unavailable for other uses.

New environmental effects

The installation of all the solar generation facility infrastructure and generator tie line would be new environmental effects in the project area. The physical presence of these facilities on the landscape would create environmental effects, or changes, relating to land use, aesthetics, wildlife impacts, changes to vegetation, and storm water runoff and infiltration.

The installation of solar PV facilities has occurred elsewhere in the state, although not of the scale of this project. There could be new effects on wildlife populations not seen before or predicted. The large increase in fenced acreage no longer accessible to certain wildlife could have effects on how animals move through the wider project area.

Unavoidable environmental effects

Construction of the proposed project would result in some unavoidable environmental effects in the project area that could not be avoided by array location, route selection, or construction methods. Some of these could be reduced or minimized, but would not be entirely eliminated as a result of project activities. Some of the unavoidable environmental effects would occur during construction, such as:

Soil compaction and erosion,
Disturbance to nearby residents due to noise, dust, and vibration,
Air quality impacts as a result of diesel fumes and dust,
Disturbance of wildlife,
Increased traffic in the project area, and;
Cutting or alteration of vegetation.

There would be some unavoidable impacts caused by the proposed project that would be longer term, likely lasting the entire time the project is in operation. These long-term unavoidable environmental effects include:

Removal of agricultural land from production,
Aesthetic impacts due to the change from a typical rural landscape to a more industrial appearance, and;
Displacement of wildlife that previously was able to access the fenced subarray sites.

Precedent-setting nature of the proposed action

This project would see the construction of more extensive solar PV generating facilities than any other solar facility in the state. The decision to treat this project as a Type II review under PSC 4, rather than the Type III action required for any solar generating facility, appears to have been useful in examining in greater detail the proposed actions and their impacts on the environment. The Commission may decide to continue to treat similar projects (size and acreage) as Type II projects under WEPA and conduct environmental assessments to analyze and review the impacts of such projects.

It could be considered whether approval and construction of a project of this type could allow for additional or future projects of this nature to occur. While that is possible, if that were to occur, all of those projects would come before the Commission and be reviewed individually and on their own merits, including the environmental impacts associated with each.

Cumulative effect of the proposed action when combined with other actions and the cumulative effect of repeated actions of the type proposed

The construction of more solar arrays in the project area, or possibly elsewhere in the state, would exacerbate some of the impacts that may be caused by this proposed project. Another large solar array would remove additional lands from agricultural use, or if no agricultural fields are available, another project may cause increased impacts to more natural areas such as wetlands, forests, or natural grasslands. Another large solar array would likely use similar fencing around the subarrays, further restricting the movement of wildlife through the area and access to habitat. Additional facilities in the area would increase the impact to aesthetics and the local rural character. Further solar farm construction could displace fossil-fueled generation, benefitting air quality.

Foreclosure of future options

The construction of the proposed solar PV facility would remove fields from agricultural production or any other use during the operational life of the project, which could be 50 years or more. The new tie line easement would likely prevent the construction of any new buildings or structures within the ROW.

Direct and indirect environmental effects

There would be both direct and indirect environmental effects as a result of this project. The analysis of the proposed project by Commission staff assumes that the multiple construction methods and BMPs described in the applications and responses to data requests are implemented.

The direct impacts include disturbance to vegetation in areas of more natural habitat, where the fields are not already cleared of vegetation. There is an increased risk of soil erosion during excavation activities or if grading is done prior to vegetation establishment. In areas near wetlands and waterways, soil erosion can cause sedimentation. Topsoil loss or deposition can occur on cropland. Storm water and erosion control methods can decrease this risk. Site restoration actions, including prompt vegetation establishment on disturbed soils, can allow soil and vegetation disturbance to be temporary. Disturbed soils can be high-risk areas for invasion by non-native invasive plants. This would be an indirect and potentially long-term negative effect on the environment, particularly if difficult to control plants such as non-native phragmites were able to establish. Therefore, loose soils should be stabilized with non-invasive cover crops as soon as possible. Machinery or equipment should be cleaned in accordance with invasive species BMPs as applicable.

Construction in and through agricultural fields would result in both temporary and long-term impacts. Some areas, such as laydown yards, parts of the generator tie line ROW, and temporary

access roads, would only be taken out of production during the construction phase of the project. The solar PV subarrays, new collector substation, and tie line structure foundations would be out of agricultural production for the operational life of the project--potentially 50 years or more. Soil compaction and topsoil loss in agricultural fields are serious concerns and can impact future productivity. If drainage tiles are broken or damaged, the drainage of a field could be affected, although some impacts might not be immediately known. The use of BMPs and post-construction soil restoration can reduce many direct impacts to agricultural operations. The eventual impacts of decommissioning the project site are not well known, but it is likely that thorough decommissioning, including decompacting soils and repairing any damaged drainage tiles, would allow for a return to agricultural use.

During construction activities, there would be increased noise, dust, and vibration in the construction areas. There would be increased traffic in the project area as employees and deliveries arrive and leave the project work areas. A visual change in the project area from open agricultural fields to a more industrial landscape would affect likely viewers differently. Some landowners that do not receive direct benefits from the project may react more negatively to the proposed project. Site-specific landscaping plans might limit the impacts to adjacent landowners.

Areas through which wildlife currently freely pass would be fenced, restricting movement and use by certain species. Direct displacement of species could occur during construction activities. Indirect effects of the proposed project could include increased pressure on or use of adjacent, non-fenced areas. There could be negative effects, including mortality or injury, on birds due to the tie line and, potentially, the solar subarrays. The environment could benefit from the use of a diverse native seed mix, particularly one that contains a range of flowering plants known to benefit pollinator species. The level of that effect would depend on the amount of, and location of, any land planted with a more 'pollinator-friendly' seed mix.

Air quality would be improved by the displacement of fossil-fueled power generation by non-emitting solar-generated electricity.

The easement payments to landowners and shared revenue dollars to the county and township could have an indirect net positive impact on the long-term economy of the area.

Recommendation

This EA informs the Commissioners, the affected public, and other interested people about the proposed project and its potential environmental and social impacts. Through data requests, additional analyses, site visits, and a review of public comments, Commission staff has attempted to provide very thorough, factual and up-to-date information about the project, potential impacts of the proposed project, and the mitigation measures that could address some of those potential impacts. This EA addresses both the solar generation facility and the generator tie line.

The EA concludes that construction and operation of both the solar generation facility and tie line would be likely to have a range of environmental effects. Commission staff has not identified any potential environmental effects of the proposed project that could be considered significant. This evaluation is arrived at assuming that some, if not all, of the mitigation measures proposed by Badger Hollow and Commission or DNR staff are used.

This assessment finds that approval and construction of this project is unlikely to have a significant impact on the human environment as defined by Wis. Stat. § 1.11, therefore the preparation of an EIS is not required.

_X__ Environmental review complete. Preparation of an environmental impact statement is not necessary.

_____ Prepare an environmental impact statement.

Submitted by: Paul Rahn
Environmental Analysis and Review Specialist

Date: December 11, 2018

This environmental assessment complies with Wis. Stat. § 1.11 and Wis. Admin. Code § PSC 4.20.

By:

Adam Ingwell, WEPA Coordinator

Date:

Acronyms

§	Section
AC	Alternating current
AES	Applied Ecological Services
AIS	Agricultural Impact Statement
ATC	American Transmission Company LLC
Badger Hollow	Badger Hollow LLC
BMP	Best management practices
CdTe	Cadmium telluride
ch.	Chapter
CL	Lean clay
Commission	Public Service Commission of Wisconsin
CPCN	Certificate of Public Convenience and Necessity
CRP	Conservation Reserve Program
CTH	County Trunk Highway
CUB	Citizens Utility Board of Wisconsin
dB	Decibel
DC	Direct current
DNH	Determination of No-Hazard
DNR	Department of Natural Resources
DPC	Dairyland Power Cooperative
DPP	Definitive Planning Phase
EA	Environmental Assessment
e.g.	Exempli gratia
EIS	Environmental Impact Statement
EMI	Electromagnetic interference
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
ft bgs	Feet below ground surface
HDD	Horizontal directional drilling
Hz	Hertz
ISO	International Standards Organization
JDA	Joint Development Agreement
KOP	Key observation point
kV	Kilovolt
mG	milliGauss
MGE	Madison Gas and Electric Company
MISO	Midcontinent Independent System Operator, Inc.
MP	Measurement point
MW	Megawatt
NAIP	National Agriculture Imagery Program
NERC	North American Electric Reliability Corporation
NHI	Natural Heritage Inventory
Noise Protocol	PSC Measurement Protocol for Sound and Vibration Assessment of Proposed and Existing Electric Power Plants
O&M	Operations and maintenance
OHWM	Ordinary high water mark

OTA	Over-the-air
PSC	Public Service Commission of Wisconsin
PPA	Purchase power agreement
PV	Photovoltaic
ROW	Right-of-way
SCADA	Supervisory control and data acquisition
SP	Poorly-graded sand
sq. ft.	Square feet
STH	State Highway
TCSB	Temporary clear span bridge
UHF	Ultra high frequency
USCS	Unified Soil Classification System
USH	U.S. Highway
UWM CRM	University of Wisconsin-Milwaukee Cultural Resources Management
WGNHS	Wisconsin Geological and Natural History Survey
WHS	Wisconsin Historical Society
WIEG	Wisconsin Industrial Energy Group
Wis. Admin. Code	Wisconsin Administrative Code
WisDOT	Wisconsin Department of Transportation
Wis. Stat.	Wisconsin Statutes
WPDES	Wisconsin Pollutant Discharge Elimination System
WPSC	Wisconsin Public Service Corporation

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