Appendix D

Draft Decommissioning Plan

DECOMMISSIONING REPORT FOR

Elk Creek Solar Project

Rock County, Minnesota

May 24, 2023

MPUC Docket No. IP-7009/GS-19-495



Prepared For:
Elk Creek Solar, LLC

Prepared By:
Westwood

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Updates Log:

Date Updated	eDockets Link for Previous Version

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1.0 Introduction

Elk Creek Solar, LLC (Elk Creek) is developing the Elk Creek Solar Project (Project), an up to 160 MW solar photovoltaic (PV) facility located in eastern Rock County, Minnesota. The Project is located in Sections 27, 34, and 35, Township 103 North, Range 44 West, and Section 3, Township 102 North, Range 44 West, Rock County, Minnesota (Figure 1). The site permit for the Project was issued on **[To be added after Site Permit issuance]** under Docket No. IP-7009/GS-19-495.

The Project is in a rural area in Vienna and Magnolia Townships, approximately 0.7 mile north of Magnolia and 4.0 miles east of Luverne. Residences are scattered throughout the rural area where land use is dominated by agricultural fields, predominately corn planted in row crops. Other than County State Aid Highway (CSAH) 3, which forms the eastern boundary of the Project, roads that surround the Project are local county or township roads. The Project is bordered on the north by 151st Street, bordered on the south by 121st Street, and bisected by 131st and 141st Streets. To the east and west, the Project is bordered by 180th Avenue on the west, CSAH 3 on the east, and bisected by 190th Avenue. The Magnolia Substation is immediately adjacent to the central solar array unit with two transmission lines at least partially within the central unit, as well. The Project is located on relatively flat fields conducive to solar development.

The Project facilities will cover approximately 1,161 acres of the 1,522-acre area where Elk Creek has secured lease agreements for the Project (i.e., site control). There are approximately 360 acres for which Elk Creek has site control that are currently not contemplated for occupation by solar facilities; this area is currently under lease with the underlying landowner but will be excluded from the area leased by Elk Creek during operation of the Project. The underlying landowners can then continue to farm the area released from the lease for the life of the Project, estimated to be 30 years. The Project will interconnect into the Magnolia Substation, which is adjacent to central unit of the Project.

Project facilities will be sited within northern, central, and southern units that will be fenced during operation of the facility; the three units collectively total 1,161 acres. Project facilities will include 438,492 solar panels covering approximately 273 acres, 11.1 miles of gravel access roads, 13.9 miles of buried or hybrid aboveground/underground electrical collection line, 40 inverters, a 0.4-acre Operations and Maintenance (O&M) Building, 1.2-acre Project Substation, 28 stormwater basins (approximately 44.2 acres), and a 250-foot 161 kilovolt (kV) gen-tie line to connect the Project substation to the Magnolia Substation.

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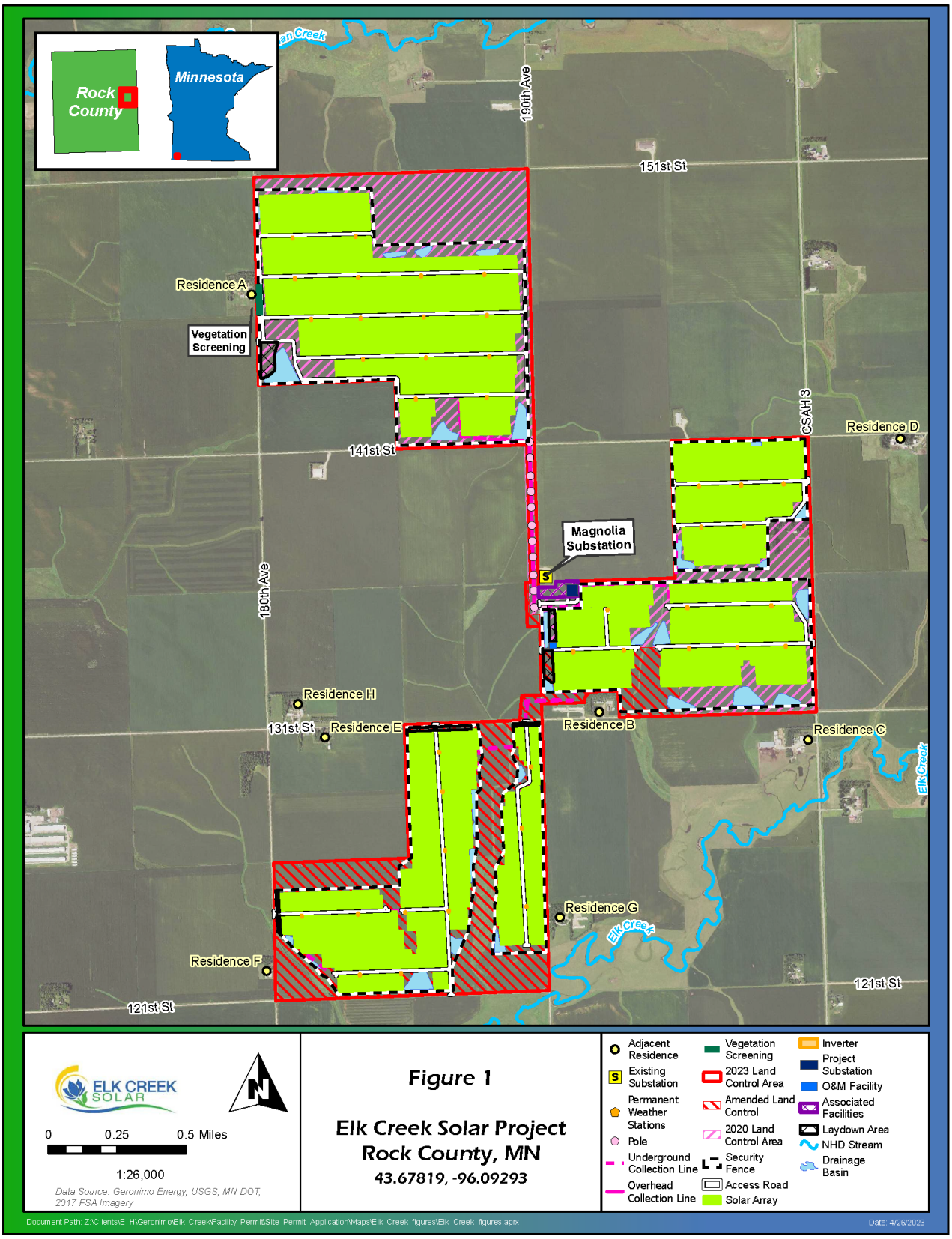
Rock County
Minnesota
190th Ave
151st St
Residence A
Vegetation Screening
141st St
CSAH 3
Residence D
Magnolia Substation
180th Ave
Residence H
131st St
Residence E
Residence B
Residence C
Elk Creek
Residence G
Elk Creek
Residence F
121st St
121st St
ELK CREEK SOLAR
0
0.25
0.5 Miles
1:26,000
Data Source: Geronimo Energy, USGS, MN DOT, 2017 FSA Imagery
Figure 1
Elk Creek Solar Project
Rock County, MN
43.67819, -96.09293
Adjacent Residence
Existing Substation
Permanent Weather Stations
Pole
Underground Collection Line
Overhead Collection Line
Vegetation Screening
2023 Land Control Area
Amended Land Control
2020 Land Control Area
Security Fence
Access Road
Solar Array
Inverter
Project Substation
O&M Facility
Associated Facilities
Laydown Area
NHD Stream
Drainage Basin
Document Path: Z:\Clients\E_H\Geronimo\Elk_Creek\Facility_Permit\Site_Permit_Application\Maps\Elk_Creek_figures\Elk_Creek_figures.aprx
Date: 4/26/2023

The solar arrays within each unit will utilize PV panels with tempered glass, approximately 4 to 7 feet long by 2 to 4 feet wide, and 1 to 2 inches thick. The panels will be installed in a north to south orientation, on a tracking rack system that utilizes galvanized steel and aluminum foundations and frame with a motor that allows the racking to rotate from east to west throughout the day. Electrical wiring will connect the panels to inverters, which will convert the power from DC to AC. The AC will be stepped up through a transformer from the inverter output voltage to 34.5 kV and brought via the collection cables to the Project substation. The electrical collection system will be installed underground or a hybrid of underground and above-ground. For both options, the AC collection line that travels along 190th Avenue to connect the northern unit to the Project substation in the central unit may be installed either underground or above-ground, depending on final engineering design.

The Project's anticipated commercial operation date (COD) is Q4 2025. Elk Creek, an independent power producer (IPP), is actively marketing the Project to a number of potential off-takers and may sell the power in the form of a Power Purchase Agreement (PPA), or the Project could be owned directly by a utility.

The information in this Decommissioning Plan (Plan) is intended to ensure that Project facilities are properly removed and/or repurposed after their useful life. The Plan outline protocols for:

- removal of all structures, underground cables, above-ground cables, and foundations;
- restoration of underlying soil and vegetation; and
- a plan ensuring financial resources will be available to fully decommission the Project site according to the conditions described in the Minnesota Department of Commerce (DOC) Energy Environmental Review and Analysis (EERA) Recommendations on Review of Solar and Wind Decommissioning Plans, and in accordance with Section 9 of the Minnesota Public Utilities Commission (MPUC) Site Permit (MPUC Docket No. IP-7009/GS-19-495).

The Contractors will comply with requirements of all permits during the decommissioning process, and the land will be restored to its pre- construction condition to the extent practicable. A list of anticipated permit requirements is provided in Section 3.5.

2.0 Decommissioning and Reclamation Objective

Solar panels are expected to have a useful commercial lifespan of approximately 35 years. Project facilities must be decommissioned if: a) facilities reach the end of their serviceable life; or b) use of the facility is discontinued. The Site Permit issued by the Commission will be for a term of 30 years, at which point the Project's operational life may be extended (with Commission review and approval) or the Project may

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cease to operate. When the Project ceases to operation, Elk Creek will be responsible for removal of all aboveground and underground equipment within the Project facility. Elk Creek will restore and reclaim the site to pre-construction topography and topsoil quality to the extent practical and assumes that most of the site will be returned to agricultural use after decommissioning.

Decommissioning includes removing the solar panels, solar panel racking, steel foundation posts and beams, inverters, transformers, overhead and shallow underground cables and lines, equipment pads and foundations, equipment cabinets, and ancillary equipment. The civil facilities, access road, security fence, and drainage structures and sedimentation basins are included in the decommissioning scope. Standard decommissioning practices would be utilized, including dismantling and repurposing, salvaging/recycling, or disposing of the solar energy improvements.

After all equipment is removed, any holes or voids created by poles, concrete pads and other equipment will be filled in with native soil to the surrounding grade and the site will be restored to pre-construction conditions, to the extent feasible. All access roads and other areas compacted by equipment will be de-compacted to a depth necessary to ensure drainage of the soil and root penetration prior to fine grading and tilling to a farmable condition or maintaining the existing vegetation. In accordance with Site Permit requirements, the Project will have been maintained with perennial native vegetation which is expected to survive decommissioning activities. Consequently, efforts to restore the site under the arrays, if the land is not returned to row crop agriculture, is expected to be limited to over-seeding. Over-seeding would be completed by a qualified native seeding contractor. Restoration efforts may also include temporary seeding as farmland or re-development of the land for other beneficial uses, based on consultation with the landowner.

3.0 List of Decommissioning Activities

3.1 Timeline

Decommissioning is estimated to take approximately 13 months to complete. This timeline is based on the assumption that the removal of the modules, racking system, and pile foundations will take approximately the same duration to remove them as it did to install them. Approximately three (3) weeks are needed for site mobilization and demobilization for decommissioning. It is also assumed that no decommissioning work will be performed during the winter months or during times of inclement weather (high winds, heavy rains).

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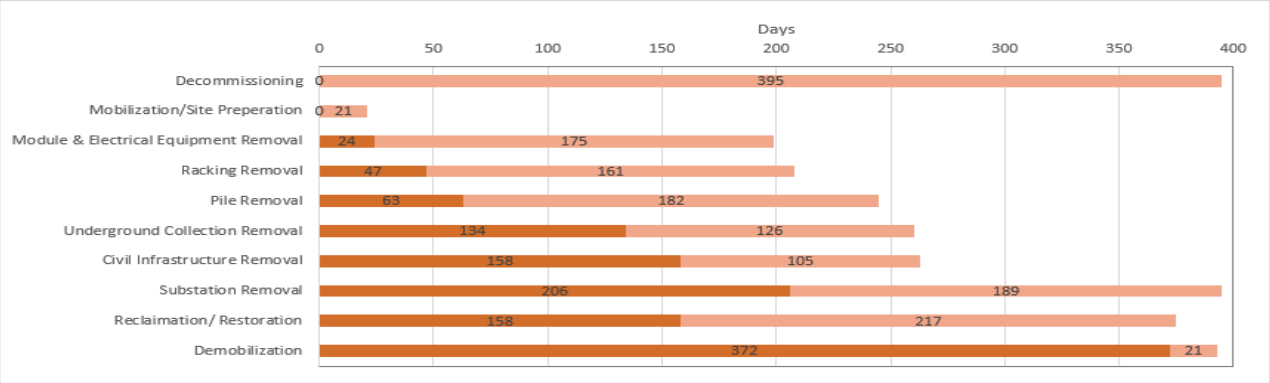
The estimated Project schedule, shown below, is an estimated timeline of the decommissioning activities. This schedule is subject to change based on actual field conditions, weather conditions, and any unforeseen conditions.

Estimated Project Schedule



**Some tasks may be completed concurrently depending upon scheduling and methods of the contractor.*
***Schedule shows duration total in calendar days and is subject to delays/changes based on weather conditions, winter and unforeseen conditions.*

The decommissioning crew(s) will ensure that all equipment and materials are recycled or disposed of properly.

3.2 Notice to Parties

Within ninety (90) days of the start of the decommissioning, a notice will be sent to landowners and local units of government. Permits will be obtained prior to the start of any work (refer to Section 3.4).

3.3 Removal and Disposal of Project Components

Details regarding the removal and disposal of the site components are found below. Typical construction equipment to be used during decommissioning will include, but is not limited to, truck-mounted cranes, loaders, bulldozers, dump trucks, and decompaction equipment.

Modules: Modules will be inspected for physical damage, tested for functionality, and disconnected and removed from racking. Functioning modules will be packed and shipped to an offsite facility for reuse or resale. Non-functioning modules will be packed, palletized and shipped to the manufacturer or a third party for recycling or disposal.

Racking: Racking and racking components will be disassembled and removed from the steel foundation posts, processed to appropriate size, and shipped to a metal recycling facility.

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Steel Foundation Posts: All structural foundation steel posts will be pulled out to full depth, removed, processed to appropriate size, and shipped to a metal recycling facility. The posts can be removed using back hoes or similar equipment. During decommissioning, the area around the foundation posts may be compacted by equipment and, if compacted, the area will be de-compacted in a manner to adequately restore the topsoil and sub-grade material to a density consistent to promote plant growth.

Aboveground and Underground Cables and Lines (Including Project Gen-Tie): All underground cables and conduits will be removed to a depth of 48 inches as specified in the lease agreements. Facilities deeper than 48 inches may remain in place to limit vegetation and surface disturbance. Topsoil will be segregated and stockpiled for later use prior to any excavation and the subsurface soils will be staged next to the excavation. The subgrade will be compacted to a density similar to the surrounding soils to promote plant growth and maintain drainage. Topsoil will be redistributed across the disturbed area.

Aboveground collection and gen-tie lines will be removed from the project and taken to a recycling facility. The poles will be felled within the Project site and any hardware, bracing, attachments will be transported along with the poles to a recycling facility. Removed pole locations will be revegetated with a seed mix specified in the approved Stormwater Pollution Prevention Plan (SWPPP) and Vegetation Management Plan (VMP).

Inverters, Transformers, and Ancillary Equipment: All electrical equipment will be disconnected and disassembled. All parts will be removed from the site and reconditioned and reused, sold as scrap, recycled, or disposed of appropriately, at Elk Creek's sole discretion, consistent with applicable regulations and industry standards.

Substation: To disconnect the Project from the grid, the switchyard will isolate the substation from the grid before dismantling the system. During this period, customers will experience short outages when the Magnolia Substation is shut down and temporary service is being established. The timing and duration of any service interruptions would be determined and communicated by the interconnecting utility (ITC Midwest).

The final disposition of the substation is unknown and will occur at the utility's discretion. ITC Midwest may decide to leave the substation for future use. If the utility decides to not keep the substation, the system will be decommissioned. Electrical collection substation decommissioning requires deconstruction of the control house/switchgear, main power transformers, breakers, bus work, ground grid, steel supports, foundations, and yard rock base, as well as reclamation of the substation site.

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Additionally, any permanent stormwater treatment facilities will be removed. Topsoil will be reapplied to match surrounding grade and maintain existing drainage patterns. The topsoil will be de-compacted to a minimum depth of 12 inches and tilled to a farmable condition or re-vegetated depending upon the location and land use at the time of decommissioning.

Much of the equipment is recycled, the main power transformers sold for refurbishing and re-use, and the remaining materials disposed of in a landfill. The substation's steel, copper ground grid, aluminum bus, and copper wire can be salvaged for scrap metal recycling. The typical transformer of this magnitude has a 40-year lifespan. All substation materials will be removed from the site via semi-trucks.

O&M Building: The O&M building will not be removed as part of the decommissioning of the Project as it can be repurposed for farm operations or other rural agri-business/light industrial/logistical uses. The Project will likely sell the O&M building and facility to a landowner or independent third party so that it can be utilized for another purpose.

Equipment Foundation and Ancillary Foundations: The ancillary foundations for Elk Creek Solar are pile foundations for both equipment skids and met stations. As described for the solar array steel foundation posts, the foundation piles will be pulled out completely. Duct banks will be excavated to a depth of at least 48 inches. All unexcavated areas compacted by equipment used for decommissioning will be de-compacted in a manner to adequately restore the topsoil and sub-grade material to a density similar to the surrounding soils. All materials will be removed from the site and reconditioned and reused, sold as scrap, recycled, or disposed of appropriately, at Elk Creek's sole discretion, consistent with applicable regulations and industry standards.

Fence: All fence parts and foundations will be removed from the site and reconditioned and reused, sold as scrap, recycled, or disposed of appropriately, at Elk Creek's sole discretion, consistent with applicable regulations and industry standards. Fence posts can be pulled out using skid-steer loaders or other light equipment. The surrounding areas will be restored to pre-Project conditions to extent feasible.

Access Roads: Facility access roads will be used for decommissioning purposes, after which removal of roads will be discussed with the landowner.

1) After final clean-up, roads may be left intact through mutual agreement of the landowner and Elk Creek, unless otherwise restricted by federal, state, or local regulations.

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2) If a road is removed, aggregate will be excavated and loaded in dump trucks using front loaders, back hoes or other suitable excavation equipment, and shipped from the site to be reused, sold, or disposed of appropriately, at Elk Creek's sole discretion, consistent with applicable regulations and industry standards. Clean aggregate can often be used as "daily cover" at landfills for no disposal cost. Another disposal option is to provide the aggregate to local landowners as clean fill. All internal service roads are constructed with geotextile fabric and eight inches of aggregate over compacted subgrade. Any ditch crossing connecting access road to public roads will be removed unless the landowner requests it remain. The subgrade will be de-compacted using a chisel plow or other appropriate subsoiling equipment. All large rocks will be removed. Topsoil that was stockpiled during the original construction will be distributed across the road corridor.

3.4 Restoration/Reclamation of Site

Elk Creek will restore and reclaim the site to the pre-Project condition consistent with the site lease agreement. Elk Creek assumes that most of the site will be returned to farmland and/or pasture after decommissioning and will implement appropriate measures to facilitate such uses. If no specific use is identified, Elk Creek will plant unvegetated portions of the site with a seed mix specified in the approved VMP. The goal of restoration will be to restore pre-construction land uses and plant communities to the greatest extent practicable while minimizing new disturbance and removal of vegetation established during operation of the facility. The decommissioning effort will implement best management practices (BMPs) outlined in the Project SWPPP to minimize erosion and to contain sediment on the Project site to the extent practicable. BMPs that will support these goals include:

1) Minimize new disturbance and removal of vegetation established during operation of the facility to the greatest extent practicable.
2) Removal of solar equipment and all access roads up to a minimum depth of 48", backfill with subgrade material, and cover with suitable topsoil to allow adequate root penetration for plants, and so that subsurface structures do not substantially disrupt groundwater movements.
3) Any topsoil that is removed from the surface for decommissioning will be stockpiled to be reused when restoring plant communities or agricultural land. Once decommissioning activity is complete, topsoil will be re-spread to assist in establishing and maintaining plant communities.
4) Stabilize soils and return them to agricultural or other use according to landowner discretion.
5) During and after decommissioning activities, install erosion and sediment control measures, such as silt fences, bio-rolls, and ditch checks in all disturbance areas where potential for erosion and

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sediment transport exists, consistent with storm water management objectives and requirements.

6) Remediate any petroleum product leaks and chemical releases from equipment operation and electrical transformers prior to completion of decommissioning.

Decommissioning and restoration activities will be completed within 13 months after the solar energy farm ceases operation.

3.5 Permitting and Post-Restoration Monitoring

It is anticipated that the following permits may be needed prior to or during decommissioning:

- U.S. Army Corps of Engineers (USACE): Section 404 Permit
- U.S. Environmental Protection Agency (EPA): Spill Prevention, Control, and Countermeasures Plan (SPCC)
- Minnesota Pollution Control Agency (MPCA): Section 401 Water Quality Certification
- MPCA: National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS) and SWPPP
- Minnesota Wetland Conservation Act Approval or No Loss Determination
- County work in right-of-way, utility, and moving permits

Decommissioning of the site will comply with permits listed above if grading activities are necessary and/or exceed permit thresholds. Elk Creek will coordinate with applicable agencies and regulatory staff to acquire needed permits prior to initiating decommissioning activities as well as notifying and coordinating with local governments and landowners. Decommissioning may include post-restoration monitoring as required by the NPDES/SDS CSW Permit and SWPPP, Agricultural Impact Mitigation Plan, VMP and other applicable requirements. In addition, Elk Creek's Field Representative assigned to decommissioning monitoring will stay in contact with the landowner, including onsite check-ins until the NPDES/ SDS CSW permit is closed.

4.0 Financial Assurance Plan

Elk Creek will be financially responsible for decommissioning the Project, which will include removal of all equipment, improvements, and facilities. The original decommissioning plan approved by the Commission will be updated and reviewed by a Professional Engineer licensed in the State of Minnesota every five years from the start of operation to account for uncertainties in future salvage values, and decommissioning costs.

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Consistent with the Solar and Wind Decommissioning Working Group recommendation, the financial assurance will begin in year 10 and the surety will provide for full decommissioning costs prior to the expiration of any PPA. During the 10th year of operation, Elk Creek will enter into a surety bond agreement, create an escrow account, create a reserve fund, or provide another form of security that will ultimately fund decommissioning and site restoration costs after Project operations cease, to the extent that the salvage value does not cover decommissioning costs. Elk Creek will decommission the Project in accordance with the conditions outlined in the MPUC Site Permit. Elk Creek will notify the appropriate landowners and local governing bodies of the decommissioning schedule and has included an obligation to decommission the Project components in applicable real estate agreements.

5.0 Estimated Net Decommissioning Costs

The decommissioning costs are calculated using current pricing. In keeping with the EERA requirements, the estimate of net costs should be updated every 5 years and when ownership changes to recognize price trends for both decommissioning costs and the salvage and resale values of the components. The cost estimate uses current pricing for removal of components based on five years of degradation and depreciation of the solar modules. Subsequent revisions to the decommissioning plan and cost estimate may be required based on changes in construction techniques and technology and changing material scrap or resale values.

To estimate the Project's decommissioning costs and salvage revenues, Westwood utilized cost data from RS Means to obtain an industry-standard, April 2023 Midwest Costs Price for scrap metals, landfills, salvage yards, and recycling facilities in 563 Rock County, MN, a proxy for the Project area. The salvage revenue in the decommissioning cost estimate is based upon the scrap value of salvaged materials including material salvaged from the solar array, inverter, transformers, and other equipment rather than the sale and reuse of the equipment. Future salvage revenue from resale or reuse of all array equipment is an unknown. The estimated decommissioning costs and salvage revenues are expressed in present-day dollars and do not account for inflation or other future changes in costs or salvage values. For the purposes of the estimate, scrap values were obtained from www.scrapmonster.com on April 14, 2023.

The cost estimate for decommissioning the Project is provided in Section 5.1. For additional detail on the assumptions made see Section 5.2.

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5.1 Cost Estimate

The estimated cost to decommission the Project and restore the Project site is $6,249,486 in present-day dollars. This total was determined by subtracting the estimated salvage revenue of $18,820,951 from the estimated decommissioning and site restoration cost of $25,070,437. Division of this estimated cost by the anticipated 160 megawatts ("MW") in the project results in a decommissioning cost of approximately $39,059 per MW.

Decommissioning Activities	Decommissioning Costs	Salvage Value	Estimated Decommissioning Cost	Estimated Cost/MW
Mobilization/ Demobilization/ Permitting	$1,413,000	$0	$1,413,000	$8,831
PV Site - Civil Infrastructure	$1,373,910	$77,114	$1,296,796	$8,105
PV Site - Structural Infrastructure	$2,345,312	$2,494,208	-$148,897	-$931
PV Site - Electrical Collection System	$10,056,217	$16,201,699	-$6,145,482	-$38,409
PV Site – Restoration	$5,371,526	$0	$5,371,526	$33,572
Substation – Transformer Removal	$123,277	$39,980	$83,297	$521
Substation – Demolition/Disposal of Substation Site Improvement Materials	$23,750	$1,750	$22,000	$138
Substation - Site Gravel Removal and Site Restoration	$111,600	$6,200	$105,400	$659
Project Management	$634,375	$0	$634,375	$3,965
Construction Totals	**$21,452,967**	**$18,820,951**	**$2,632,016**	$16,450
Contingency	$3,005,995	$0	$3,005,995	$18,787
County Administration Costs	$611,474	$0	$611,474	$3,822
Totals	**$25,070,437**	**$18,820,951**	**$6,249,486**	$39,059

*Based upon a preliminary project design of 40 power blocks.

The resale and salvage values are necessary for Elk Creek to account for the long-term assets and liabilities, and value as a going concern. Under EERA recommendations a financial assurance is not required during the first ten (10) years of operation. A bond will be posted no earlier than the 10th anniversary from the date of Operation with the County. The cost of decommissioning will be updated every five years after the tenth year of operation in accordance with the EERA recommendations.

5.2 Decommissioning Assumptions

To develop a cost estimate for the decommissioning of the Elk Creek Solar Project, Westwood engineers made the assumptions and used the pricing references provided below. Costs were estimated based on

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current pricing, technology, and regulatory requirements. The assumptions are listed in order from top to bottom of the estimate spreadsheet. When publicly available bid prices or Minnesota Department of Transportation (MnDOT) bid summaries were not available for particular work items, we developed time and material-based estimates considering composition of work crews and equipment and material required using RS Means. When materials have a salvage value at the end of the Project life, the construction activity costs, and the hauling/freight cost are separated from the disposal costs or salvage value to make revisions to salvage values more transparent.

7) Decommissioning costs are based on current pricing. The initial financial security covers the first 10 years of operation, and at year 10 the cost estimate will be revised. The anticipated life of the Project is 30 years.
8) This Cost Estimate is based on preliminary drawings dated 05/01/2023 and site plan data provided by National Grid Renewables Development, LLC.
9) A project of this size and complexity requires a half-time project manager, full-time superintendent, two full-time field engineers, and a full-time clerk.
10) Common labor will be used for the majority of the tasks except for heavy equipment operation. Since MnDOT unit prices are used, for some items, the labor rates will reflect union labor rates.
11) Mobilization was estimated at approximately 7% of total cost of other items.
12) Permit applications required include the preparation of a SWPPP and a SPCC Plan.
13) Road gravel removal was estimated on a time and material basis using a 16-foot width and an 8- inch thickness for the access roads. Substation aggregate is included in the substation quantities. Since the material will not remain on site, a hauling cost is added to the removal cost. Road aggregate can often be disposed of by giving to landowners for use on driveways and parking areas. Many landfills will accept clean aggregate for use as “daily cover” and do not charge for the disposal.
14) Grade Road Corridor reflects the cost of mobilizing and operating light equipment to spread and smooth the topsoil stockpiled on site to replace the aggregate removed from the road.
15) Erosion and sediment control along road reflects the cost of silt fence on the downhill side of the road and surrounding all on-site wetlands.
16) Topsoil is required to be stockpiled on site during construction, therefore this topsoil is available on site to replace the road aggregate, once removed. The site is presumed to

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be overseeded at the end of project life, as the decommissioning activities are not expected to heavily compact the soils, and the arrays will have been planted with native seed mixes.

17) Fence removal includes loading, hauling, and recycling or disposal. Fence and posts weigh approximately 10 pounds per foot.
18) Array support posts are generally lightweight "I" beam sections installed with a piece of specialized tracked equipment. Crew productivity is approximately 240 posts per day, and the same crew and equipment should have a similar productivity removing the posts, resulting in a per post cost of approximately $15.84.
19) A metal recycling facility (TJN Enterprises East Yard) is located in Sioux Falls, South Dakota, 32 miles from the Project site. Pricing was acquired from www.scrapmonster.com. The posts weigh approximately 150 pounds each, and we estimate the hauling costs at approximately $0.27 per ton mile. The pricing from Scrapmonster is adjusted to 75 percent of the published price to reflect the processing required for the posts to fit recycling requirements and TJN Enterprises East Yard's margin.
20) Based on the review of a manufacturer's details of the array support structures, the structures weigh approximately 15 pounds per linear foot or array. The facility has 438,492 modules, for a total module weight of 16,437 tons. The arrays are made of steel pipes so a crew with hand tools can disassemble and cut the pieces to sizes for recycling at a rate of about 1,800 pounds per person per hour, or about $100 per ton.
21) Hauling the steel to Sioux Falls, South Dakota at $0.27 per ton mile costs about $8.68 per ton.
22) The solar panels rated at 475 watts measure approximately 4.08 feet by 6.64 feet and weigh 75.0 pounds so they can easily be disconnected, removed, and packed by a three-person crew at a rate we estimate at 12 panels per person per hour.
23) Based on preliminary design information, it is expected that 4200 kVA inverters will be used on this Project. Pad mounted Inverters are modular medium sized enclosures (9'-2" long, 7'-7" tall, and 5'-3" deep (SC 4200 UP-US 4200 kVA US 1500 V) that are mounted on a metal frame. They weigh 8,800 pounds each and can be disconnected by a crew of electricians. They must be lifted by a truck mounted crane for transport to the recycler. They contain copper or aluminum windings.
24) Transformers for this Project will likely be mounted on the same equipment skids as the

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inverters. The transformers and associated cabinets weigh approximately 20,000 pounds and contain either copper, or more commonly, aluminum windings that have significant salvage value. They are typically oil filled, but most transformer recyclers will accept the transformers with oil. The estimated costs include removal of the metal frames and conduits feeding the equipment.

25) Medium voltage (MV) equipment and SCADA equipment are mounted on the same equipment skid as the transformer and enclosed in weatherproof cabinets. Their size requires light equipment to remove them. The costs shown include the removal of the metal frame.
26) The underground collector system cables are placed in trenches, inside of PVC conduits, with a minimum of 3 feet of cover.
27) To reduce tracking of sediment off-site by trucks removing materials, we have included a rock construction entrance priced based on state MnDOT bid prices.
28) Perimeter control pricing is based on a sediment fence placed on the downgrade side of the work area perimeters and protecting wetlands and drainage swales within the Project area. Pricing is based on RS Means unit prices.
29) No topsoil will be removed from the landowner's property or used on other landowners' property during decommissioning. Most of the site will not have been compacted by heavy truck or equipment traffic so no topsoil will need to be imported, and very few areas will need to be decompacted.
30) Metal salvage prices (steel, aluminum, copper) are based on quotes from www.scrapmonster.com for the U.S. Midwest in April 2023. These prices are based on delivery to the recycling facility with the material prepared to meet size, thickness, cleanliness and other specifications. A reduction of 25% has been taken from this price to reflect the difficulty of realizing the full spot prices posted. The prices are three months old at the time they are displayed on the website.
31) The steel posts and array racking are priced based on 75% of the HMS (high melt steel) 80/20 the price listed on www.scrapmonster.com in April 2023.
32) Solar module degradation is approximately 0.50% per year, or 96% of capacity remaining after 5 years, and 83 percent capacity remaining after 30 years. The manufacturer guarantees that panels will have 98% the rated capacity when new, so combining the guaranteed capacity and the degradation, the estimate uses 96 percent capacity after five years. There is currently a robust market for used solar panels and pricing can be

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found on Solar Biz, eBay and other sites. To avoid unconservative pricing for the used modules we used a pricing of 80 percent of the $0.0875 per watt price quoted by We Recycle Solar for a similar project within the last two months. The price is based on the buyer transporting panels placed on pallets from the Project site to a We Recycle Solar facility.

33) There is an active market for reselling and recycling electrical transformers and inverters with several national companies specializing in recycling. We have assumed that the electrical equipment will be obsolete at the time of decommissioning so we have based the pricing on a percentage of the weight that reflects the aluminum windings that can be salvaged. Pricing was obtained from scrapmonster.com in April 2023, for used transformer scrap at a price of $0.40 per pound.
34) The collection lines are priced assuming copper conductor wire for the DC circuits, which is typical. The prices used reflect a reduced yield of the copper resulting from the insulation and other materials that must be stripped from the wire so that the copper can be recycled. The estimate uses the Midwest price of #2 copper wire with an 50 percent recovery rate as found on www.scrapmonster.com in April 2023, which is $1.37 per pound. For the salvage value we have assumed 75 percent of the published price.
35) The underground collection lines are assumed to be aluminum conductor. The majority of the length of the collection lines will be buried deep enough so that they do not have to be removed. Those sections coming up out of the ground at junction boxes, or otherwise, can be salvaged. The salvage value is based on the Midwest price of E.C. Aluminum Wire as found on www.scrapmonster.com in April 2023, which is $1.21 per pound. We have reduced the price to 50 percent of the quoted price to reflect the complications of stripping insulation and separating the materials.
36) Care to prevent damage and breakage of equipment, PV modules, inverters, capacitors, and SCADA must be exercised, but removal assumes unskilled common labor under supervision.
37) All salvage is based on the weights of bulk material or equipment.

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