Westwood

3701 12th St. N, Suite 206
St. Cloud, MN 56303

main (320) 253-9495
fax (320) 358-2001

# MEMORANDUM

Date: August 9, 2022

**Re:** Wild Springs Decommissioning Cost Estimate
File 0007627.00

To: Melissa Schmit, National Grid Renewables

From: August Christensen

Please find below an explanation of the decommissioning cost estimate update and the assumptions used for calculating the decommissioning values and salvage vales for the Wild Springs Solar Project. Quantities have been estimated based off a provided layout and design.

## Decommissioning Cost Estimate Update

It was identified during our latest review that the decommissioning estimate provided on 09/25/2020 was based off of a prior Project design and the estimate needed to be updated with quantities from the current provided design. The subtotals for both Construction and Salvage values have been revised after the updates, resulting in a lower end cost for Total Demolition Minus Salvage. Total linear footage was estimated using provided PDFs, actual lengths of these items may vary from what is estimated. Overall DC Megawatts changed due to a change in module wattage and module quantities. Below is a summary of the changes made to the estimate.

1. *Mobilization/Demobilization* – the Unit/Total Cost has been revised as it is based on 7% of the current total decomissioning cost
2. *Civil Infrastructure* – the total civil infrastructure cost has been reduced due to the following items being revised:
    a. *Removal Gravel Surfacing from Road* – the Quantity and Total Cost have been lowered due to a decrease in total inverters which led to a decrease in total road lengths.
    b. *Haul Gravel Removed from Road* – the Quantity and Total Cost have been lowered due to a decrease in total inverters which led to a decrease in total road lengths.
    c. *Disposal of Gravel Removal from Road* – the Quantity and Total Cost have been lowered due to a decrease in total inverters which led to a decrease in total road lengths.
    d. *Grade Road Corridor (Re-spread Topsoil)* – the Quantity and Total Cost have been lowered due to changes in RSMeans values and a decrease in total road length in current design.
    e. *Erosion and Sediment Control for Road Restoration* – the Quantity and Total Cost have been lowered due to changes in RSMeans values and a decrease in total road length in current design.
    f. *Turf Establishment on Removed Road Area* – the Quantity and Total Cost have been lowered due to changes in RSMeans values and a decrease in total road length in current design.

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g. *Removal of Security Fence* – the Quantity and Total Cost have been lowered due to changes in RSMeans values and a decrease in total linear feet of fence in the current design.

3. *Structural Infrastructure* – the total structural infrastructure cost has been reduced due to the following items being revised:
   a. *Removal Tracker Steel Foundation Posts* – the Quantity and Total Cost have been lowered due to the total number of tracker blocks being reduced in the current design.
   b. *Haul Tracker Steel Posts* – the Quantity and Total Cost have been lowered due to the total number of tracker blocks being reduced in the current design.
   c. *Removal Drive Motor Posts* – the Quantity and Total Cost have been lowered due to the total number of tracker blocks being reduced in the current design, which reduced the total number of motor posts and a change in RSMeans pricing.
   d. *Haul Drive Motor Posts* – the Quantity and Total Cost have been lowered due to the total number of tracker blocks being reduced in the current design.
   e. *Remove and Load Metstation Foundation* – the Unit Price and Total Cost have been increased due to changes in RSMeans values.
4. *Electrical Collection/Transmission System* – the total electrical collection/transmission system cost has been reduced due to the following items being revised:
   a. *Removal of PV Panels* – the Quantity and Total Cost have been lowered due to the total number of PV Panels being reduced and the wattage changed from 425W to 485W in the current Project design.
   b. *Removal of Combiner Boxes*– the Quantity and Total Cost have been lowered due to the total number of PV Panels being reduced in the current Project design, reducing the number of combiner boxes needed.
   c. *Removal of PCU Station*– the Quantity and Total Cost have been lowered due to the total number of PV Panels being reduced and using updated equipment in the current Project design.
   d. *Haul Inverters and Transformers to Recycler*– the Quantity and Total Cost have been lowered due to the total number of Inverters being reduced in the current Project design. The current layout assumes 34 inverters at 4200kVA/kW vs the previous design had 88 inverters at 1500kVA/kW previously.
   e. *Removal of DC Collector Cables*– the Quantity and Total Cost have been increased due to the assumption that the cables will be fully removed due to DC lines being above ground which increase salvage values.
   f. *Removal of Underground (AC) Medium Voltage System Cables*– the Quantity and Total Cost have been lowered due to the total length of cable being reduced in the current Project design. AC/MV collection assumed to be buried at least 48” and abandoned in place. Service whips and stub up transitions at inverters to be removed.
   g. *Load and Haul Cables for Recycling*– the Quantity and Total Cost have been lowered due to the total length of cable being reduced in the current Project design.
   h. *Removal of Fiber Optic Cable*– the Quantity and Total Cost have been lowered due to the total length of cable being reduced in the current Project design. AC/MV

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collection assumed to be buried at least 48"and abandoned in place. Service whips and stub up transitions at inverters to be removed.

i. *Removal of Grounding Wire*– the Quantity and Total Cost have been lowered due to the total length of cable being reduced in the current Project design. AC/MV collection assumed to be buried at least 48" and abandoned in place. Service whips and stub up transitions at inverters to be removed.

5. *Site Restoration*– the total Site Restoration cost has been increased due to the following items being revised:
    a. *Stabilized Construction Entrance* – the Quantity and Total Cost have been lowered due to the total number of entrances being reduced in the current Project design.
    b. *Permanent Seeding on Area within Removed Array* – the Unit Price and Total Cost have been increased due to changes in RSMeans values.
6. *Project Management*– the total Project Management cost has been reduced due to the following items being revised:
    a. *Field Engineer*– the Unit Price and Total Cost have been increased due to changes in RSMeans values.
7. *Salvage* – the Total Value has been reduced due to the following items being revised:
    a. *Fencing*– the Total Cost has changed due to changes in quantities in the current design and increased scrap prices on scrapmonster.com
    b. *Steel Posts* - the Total Cost has changed due to changes in quantities in the current design and increased scrap prices on scrapmonster.com
    c. *Module Racking*- the Total Cost has changed due to changes in quantities in the current design and increased scrap prices on scrapmonster.com
    d. *PV Modules* - the Quantity and Total Cost have been lowered due to the total number of PV Panels being reduced in the current Project design.
    e. *Inverters and Transformers* – the Total Cost has changed due to a decrease in total inverters in the current design and increased scrap prices on scrapmonster.com
    f. *DC Collection Lines*– the Total Cost has changed due to changes in quantities in the current design, assuming DC is above ground and therefore will be fully removed and increased scrap prices on scrapmonster.com.
    g. *AC Collection Lines* - the Total Cost has changed due to changes in quantities in the current design and increased scrap prices on scrapmonster.com. AC/MV collection assumed to be buried at least 48" and abandoned in place. Service whips and stub up transitions at inverters to be removed.
    h. *Grounding Wire*- the Total Cost has changed due to changes in quantities in the current design and increased scrap prices on scrapmonster.com. AC/MV collection assumed to be buried at least 48" and abandoned in place. Service whips and stub up transitions at inverters to be removed.
    i. *Substation Transformers*- the Total Cost has increased due to changes in estimated scrap prices from scrapmonster.com.

## Decommissioning Assumptions

To develop a cost estimate for the decommissioning of the Wild Springs Solar Project, Westwood engineers made the following assumptions and used the following pricing references: Costs were

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estimated based on current pricing, technology, and regulatory requirements. The assumptions are listed in order from top to bottom of the estimate spreadsheet. We developed time and material based estimates considering composition of work crews and equipment and material required using RSMeans data. 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.

1. Decommissioning year is based on a 35 year projected life of the project.
2. This Cost Estimate is based on plans dated 07/15/2022.
3. A project of this size and complexity requires a full time project manager or support staff.
4. Common labor will be used for the majority of the tasks except for heavy equipment operation. Since SDDOT unit prices are used, where possible, the labor rates will reflect union labor rates.
5. Mobilization was estimated at approximately 7% of total cost of other items.
6. Permit applications required include the preparation of a Storm Water Pollution Prevention Plan (SWPPP) and a Spill Prevention Control and Countermeasure (SPCC) Plan.
7. Road aggregate removal was estimated on a time and material basis using a 16 foot width plus an additional 4 foot shoulder on both sides 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.
8. 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.
9. 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.
10. Topsoil is required to be stockpiled on site during construction, therefore this top soil is available on site to replace the road aggregate, once removed. Subsoiling cost to de-compact roadway areas is estimated as $350 per acre (based on state DOT bid prices), and revegetation on removed road area, which includes seed, fertilizer, lime, and care until vegetation is established is $4,350 per acre. The majority of the project area is “over-seeded” since the decommissioning activities are not expected to eliminate the existing grasses and vegetation under the arrays or heavily compact the soils. Over-seeding does not include fertilizer and lime, and is estimated at $3,150 per acre.
11. Fence removal includes loading, hauling, and recycling or disposal. Fence and posts weigh approximately 10 pounds per foot.
12. 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

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the same crew and equipment should have a similar productivity removing the posts, resulting in a per post cost of approximately $13.00.

13. A metal recycling facility is located in Rapid City, SD is 26 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 $0.28 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 the facility's margin.
14. Based on the review of a manufacturer's details of the array support structures the structures weigh approximately one pound per square foot. The arrays are made of light weight steel and aluminum angles, mounted on the foundation piles, which the panels are bolted to. So a crew with hand tools can disassemble and cut the pieces to sizes for recycling at a rate of about 30 arrays per person four man crew per day based on RS Means cost data.
15. Hauling the steel to Rapid City, SD at $0.28 per ton.
16. The solar panels rated at 485 watts are estimated to be 4 feet by 6 feet and weigh 50 pounds so they can easily be disconnected, removed, and packed by a three person crew at a rate we estimate at 12 panels per hour.
17. Inverters used on this project have been estimated based off of projects of similar size. Pad mounted Inverters are modular medium sized enclosures (18'-4" long, 7'-3" tall, and 5'-3" deep) that are mounted on a concrete slab. They weigh 13,220 pounds, 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.
18. Transformers for this project will likely be mounted on the same concrete pads as the inverters. The transformers and associated cabinets weigh approximately 15,000 pounds and contain either copper, or more commonly, aluminum windings that have significant salvage value. They are typically oil filled, and most transformer recyclers will accept the transformers with oil. The estimated costs include removal of the concrete pads and conduits feeding the equipment.
19. Medium voltage (MV) equipment and SCADA equipment are mounted on the same concrete pad as the transformer and enclosed in weather proof cabinets. Their size requires light equipment to remove them. The costs shown include the removal of the concrete pads.
20. The underground MV/AC collector system cables are placed in trenches, inside of PVC conduits, at a depth of at least 48".
21. To reduce tracking of sediment off-site by trucks removing materials, we have included a rock construction entrance priced based on state DOT bid prices.
22. Perimeter control pricing is based on a sediment fence placed on the downgrade side of the work area perimeters towards neighboring properties, and protecting wetlands and drainage swales within the project area. Pricing is based on RSMeans unit prices.

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23. No topsoil is planned to be removed from the site during decommissioning and most of the site will not have been compacted by heavy truck or equipment traffic so the site turf establishment cost is based on RS Means unit prices for applying lime, fertilizer, seed, and mulch at the price of $4,350 per acre plus an allowance for some areas to be de-compacted. For areas within the array, that are receive over-seeding, the price is adjusted to $3,150 to reflect the low seeding rate, and the lack of fertilizer and lime applied.
24. Metal salvage prices (steel, aluminum, copper) are based on quotes from www.scrapmonster.com for the U.S. Midwest from May 2022. 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.
25. The steel posts and array racking are priced based on 75 percent of the HMS (high melt steel) 80/20 the price listed on www.scrapmonster.com from May 2022. ($505 per ton)
26. There is currently a robust market for used solar panels and pricing can be found on, Solar Biz, eBay and other sites. We have assumed that as long as the modules are producing power they will have economic value. The panels will experience a degradation of output over the life of the facility. The manufacturer guarantees that panels will have an output of 98% of the rated capacity when new/installed. Solar module degradation rate is estimated at 0.50% per year, or 96% of capacity remaining after 5 years, and 82% capacity remaining after 35 years. By combining the guaranteed capacity at install and the degradation expected over 35 years, this estimate uses an output capacity of 80.5% for the modules at the time of decommissioning. Recycling/reuse programs have provided quotes to purchase used modules from solar facilities to be re-purposed for other types of projects. To avoid un-conservative pricing for this project, the price used to calculate the salvage value is roughly 80 percent of the value that has been quoted for other projects, resulting in a value of $0.07 per watt. A 5% loss of modules has been assumed from removing panels from the support structure. The salvage value for modules is then calculated as the output capacity of modules (watts) at 80.5% multiplied by the total number of panels (less 5%) multiplied by $0.07 per watt. The price is based on the buyer transporting panels placed on pallets from the project site.
27. 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 www.scrapmonster.com from May 2022. We have

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assumed a 25% recovery of the weight of the transformers and inverters for copper or aluminum windings.

28. 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 a 50 percent recovery rate as found on www.scrapmonster.com from May 2022. For the salvage value we have assumed 50 percent of the published price.
29. The underground collection lines are assumed to be aluminum conductor. The DC lines will be placed above ground and therefore will be fully removed for salvage. The AC/MV Collection assumed to be buried at least 48" and abandoned in place. Service Whips and stub up transitions at inverters to be removed. Those sections coming up out of the ground at junction boxes, or otherwise, can also be salvaged. Assumed lengths of 25ft per service loop and 15ft on stub up transitions to estimate salvage values for each inverter and phase. The salvage value is based on the Midwest price of E.C. Aluminum Wire as found on www.scrapmonster.com from May 2022. We have reduced the price to 50 percent of the quoted price to reflect the complications of stripping insulation and separating the materials.
30. 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.
31. All salvage is based on the weights of bulk material or equipment.