Decommissioning Plan and Retirement Cost Evaluation

Glen Ullin Energy Center, LLC

Glen Ullin Energy Center
Project No. 109384

Revision 0
8/20/2019

Decommissioning Plan and Retirement Cost Evaluation

prepared for

Glen Ullin Energy Center, LLC
Glen Ullin Energy Center
Mercer and Morton Counties, North Dakota

Project No. 109384

Revision 0
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prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
ACE	ALLETE Clean Energy
BMPs	Best management practices
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
GUEC	Glen Ullin Energy Center, LLC
kV	Kilovolt
MW	Megawatt
NDAC	North Dakota Administrative Code
O&M	Operations and maintenance
Project	Glen Ullin Energy Center
Study	Decommissioning Plan and Retirement Cost Evaluation

1.0 EXECUTIVE SUMMARY

1.1 Introduction

Burns & McDonnell was retained by Glen Ullin Energy Center, LLC, a wholly owned subsidiary of ALLETE Clean Energy, to conduct a decommissioning cost evaluation for the Glen Ullin Energy Center, which is proposed to be located in Mercer and Morton Counties, North Dakota. The Project is proposed to consist of 39 GE 2.5-116 and 4 GE 2.3-116 wind turbine generators that combine to produce a nominal rating of 106.7 megawatts.

The objective of the decommissioning cost evaluation was to review the Project and provide a recommendation regarding the decommissioning cost and plan for retiring its facilities at the end of its useful life. The overall Project configuration that was used as the basis for this Study is shown in Appendix A.

1.2 Methodology

When it is determined that the Project should be retired, the above-grade steel structures and turbine nacelles are assumed to have significant scrap value to a salvage contractor, offsetting a portion of the cost to remove these items. In accordance with the North Dakota Administrative Code, the Study will provide estimates which both include and exclude the salvage value. The Project will incur costs for removal and disposal of the blades, foundations, and other Project facilities, along with the costs for the restoration of the site following the removal of salvageable equipment.

The decommissioning cost estimates provided herein include the costs to return the site to a condition compatible with the surrounding land, similar to the conditions that existed before the development of the Project. Included are the costs to retire the power generating equipment that is part of the Project to a depth of 4 feet below grade in accordance with the North Dakota Administrative Code.

1.3 Results

The total cost to decommission the Project at the end of its useful life based on the assumptions noted herein is estimated to be approximately $5,414,200 ($125,911 per turbine). With scrap credit included, the net cost to decommission the Project is approximately $2,028,200 ($47,167 per turbine). It is expressly noted that while costs are presented both in total and per turbine, a change in the quantity of turbines may not cause the total decommissioning cost to increase or decrease linearly by the per turbine cost, due to non-scalable differences in balance-of-plant costs and other similar factors.

2.0 PROJECT OVERVIEW

2.1 Project Summary

Burns & McDonnell was retained by Glen Ullin Energy Center, LLC ("GUEC"), a wholly owned subsidiary of ALLETE Clean Energy ("ACE"), to conduct a decommissioning cost evaluation ("Study") for the Glen Ullin Energy Center ("Project"), which is proposed to be located in Mercer and Morton Counties, North Dakota. The Project is proposed to consist of 39 GE 2.5-116 and 4 GE 2.3-116 wind turbine generators that combine to produce a nominal rating of 106.7 megawatts ("MW").

The purpose of the decommissioning cost evaluation was to review the Project and to make a recommendation regarding the decommissioning plan for retiring the facility at the end of its useful life.

2.2 Wind Turbines

The Project consists of 39 GE 2.5-116 and 4 GE 2.3-116 wind turbines resulting in a nominal rating of 106.7 MW. All turbines were assumed to be fully removed as part of this Study.

Each GE 2.5-116 wind turbine includes a 90-meter tapered steel tower which supports the turbine nacelle mounted on top. The nacelle of each turbine includes three blades mounted to the nacelle rotor with a total rotor diameter of approximately 116 meters. The turbine tower and nacelle weigh approximately 162 metric tons and 68 metric tons, respectively, with individual blade weights of approximately 11 metric tons for this turbine model.

Each GE 2.3-116 wind turbine includes an 80-meter tapered steel tower which supports the turbine nacelle mounted on top. The nacelle of each turbine includes three blades mounted to the nacelle rotor with a total rotor diameter of approximately 116 meters. The turbine tower and nacelle weigh approximately 144 metric tons and 68 metric tons, respectively, with individual blade weights of approximately 11 metric tons for this turbine model.

2.3 Wind Turbine Foundations

Each wind turbine tower is to be supported by a cylindrical concrete pedestal that rests on a sloped, octagonal concrete spread footing, which is common throughout the wind industry. A single foundation design was used for both models of wind turbine. Foundation IFC drawings indicate the design includes a pedestal with a diameter of 18.5 feet and a depth below grade of 4.2 feet with a 6-inch projection above-grade. The base supporting the pedestal has a lower diameter of 54 feet and extends to a maximum depth of 9.5 feet below grade.

All underground facilities for the Project are to be removed to a depth of at least four feet below grade in accordance with the North Dakota Administrative Code ("NDAC"). Thus, the concrete pedestal is to be removed down to four feet below-grade and backfilled as part of the decommissioning, and the remaining foundation will be left in place.

2.4 Access Roads

Each wind turbine has an access road to support construction and allow for vehicle access to facilitate inspections and maintenance of the turbines and associated equipment during operation. These access roads are assumed to be crushed rock surfaced roads with a width of 16 feet and a depth of 8 inches. According to Civil IFC drawings provided by ACE, 15 miles of access roads were assumed to be removed, decompacted, and seeded as part of this study.

2.5 Collection System

Each wind turbine generates three-phase electrical power that is transformed to 34.5 kilovolts ("kV") via a pad-mounted transformer. All such transformers were assumed to be removed as part of this Study. Power from each transformer is delivered to an onsite collector substation via an underground power collection system. It was assumed that all cables will be buried at a minimum depth of 4 feet below-grade. At this depth, all cables (including both power and communication cabling) were assumed to remain in place after the Project is decommissioned as they exceed the depth requirement set forth in the North Dakota Administrative Code (2 feet), the Morton County Land Use Code (no removal required), and the Mercer County Zoning Ordinance (3 feet). However, if the contractor deems the salvageable value of the collector system to be greater than the cost for removal, the contractor shall remove the collector system at its own cost. The only cost incurred from the collection system will be the above-grade junction boxes.

2.6 Project Substation

Power from each wind turbine is delivered via underground power collection circuits to an on-site collection substation, where it is transformed from 34.5 kV to 230 kV via one main power transformer. Issued-for-construction drawings were provided by ACE for the Project substation, which includes one high-voltage breaker, lightning masts, disconnect switches, busbars, and a control building.

GUEC's ownership ends at the collector substation. The outgoing transmission lines and interconnecting facilities were assumed to be the property and responsibility of others and were not included in the Study.

2.7 Operations and Maintenance Facility

The Project includes an independent operations and maintenance ("O&M") facility on the Project site. The O&M building includes an area for maintenance activities and a laydown yard where spare

components can be stored. The O&M building has nominal dimensions of 100 feet by 40 feet by 18 feet and is assumed to consist of a pre-engineered metal building with a six-inch thick concrete foundation. A perimeter fence with dimensions of 330 feet by 270 feet surrounds the O&M building. Crushed rock surrounds the O&M building and extends 3 feet beyond the perimeter fencing in all directions.

2.8 Meteorological Equipment

The project includes one permanent 283-foot self-supported lattice-type tower. The tower was assumed to be fully removed as part of this study, including its supporting foundation to a depth of 4 feet.

3.0 DECOMMISSIONING

3.1 Decommissioning Plan

When it is determined that the Project should be retired, the Project equipment will be removed as noted herein. It is assumed that the Project will incur costs for removal and disposal of the wind turbines, wind turbine foundations, collector system junction boxes, and the meteorological tower and foundation, as well as for the restoration of the site following the removal of equipment, although the above grade steel, aluminum, and copper equipment is expected to have significant scrap value to a salvage contractor. All recyclable materials will be recycled to the extent possible, while all other non-recyclable waste materials will be disposed of in accordance with state and federal law.

The wind turbine blades will be removed from the wind turbine nacelle rotors using a crane, cut into manageable sized sections, loaded onto a trailer, and hauled to a local landfill for disposal. The wind turbine blades are constructed from a composite material that is assumed to have no salvage value at the time of decommissioning. The turbine nacelles will be removed from the towers with a crane and loaded onto a trailer. The towers will be disassembled and loaded onto a trailer as well. The nacelle and towers will be hauled to a scrap yard for recycling. The cost estimate presented in this report includes the cost to haul the turbines and nacelles to the scrap yard.

All concrete wind turbine foundations will be removed to a depth of 4 feet below grade in accordance with the NDAC; the portions of the foundation that are deeper than 4 feet below-grade will be abandoned in place. The recovered concrete will be demolished, loaded into a dump truck, and hauled to a local landfill for disposal. Voids left from the removal of the concrete footing will be backfilled with surrounding subsoil and topsoil and fine graded to provide suitable drainage.

The Project main step-up transformer, control building, crushed rock surfacing and surrounding fencing at the Project Substation will be removed as part of the decommissioning plan.

Areas where crushed rock surfacing has been removed, including all roads, will be fine graded to ensure suitable drainage. In right-of-way and non-agricultural areas, the ground will be seeded to prevent erosion. The removed crushed rock will be loaded into a dump truck and hauled offsite. Crushed rock can be recycled and reused, and typically has a salvage value as a commodity equal to or greater than the cost to load and haul the gravel to an end user. However, for the sake of this Study, the cost to remove the crushed rock, load it into dump trucks, and haul it offsite will be at the expense of the Project.

Prior to commencing activities associated with foundation removal, crushed rock surfacing removal, or any other earthwork, an approved erosion control plan will need to be developed by the demolition contractor. Best management practices ("BMP") applicable at the time that decommissioning activities occur will need to be implemented by the contractor for control of storm water runoff; since decommissioning activities are not anticipated to occur for 20 years or more, BMPs may differ from current standards. However, if decommissioning takes place in the near future, Burns & McDonnell would anticipate BMPs such as silt fencing and proper compaction, seeding, and mulching practices to be implemented. To the extent necessary, permits relating to decommissioning activities will need to be obtained, including permits from the Environmental Protection Agency and the United States Army Corps of Engineers. The costs included in this Study are expected to be sufficient for a demolition contractor to develop suitable plans for the control of surface water drainage and accumulation and a plan, where appropriate, for backfilling, soil stabilization, compacting, and grading prior to commencing demolition activities.

All disturbed areas at the site will be returned to as close to predevelopment conditions as possible. This will allow all land disturbed by the construction of the Project to be returned to its predevelopment use at the end of the useful life of the Project. The cost estimates provided in the following section include activities and costs to return the land to a condition suitable for agricultural use subsequent to the decommissioning of the Project.

The activities associated with the decommissioning plan described above are anticipated to be completed within a six month timeframe, according to the following estimated schedule:

- Decommissioning Planning & Permitting: 2 months
- Demolition: 3 months
- Site Restoration 1 month

Additional time may be required for post-decommissioning activities, including monitoring of new vegetation. However, this timetable and the cost estimates below should provide sufficient time and budget to comply with any applicable health and safety regulations.

3.2 Decommissioning Costs

The total cost to decommission the Project at the end of its useful life, based on the assumptions noted herein including the original construction methods of the Project, is estimated to be approximately $5,414,200 ($125,911 per turbine). With scrap credit included, the net cost to decommission the Project is approximately $2,028,200 ($47,167 per turbine). A detailed breakdown of these costs is included in

Appendix B. It is expressly noted that while costs are presented both in total and per turbine, a change in the quantity of turbines to be decommissioned may not cause the total decommissioning costs or decrease linearly by the per turbine cost, due to non-scalable differences in balance-of-plant costs and other similar factors.

3.3 Decommissioning Assumptions

In addition to other assumptions noted herein, the following key assumptions were utilized for the Study:

1. All costs are presented in 2019 dollars using a demolition site cost index of 103.1 percent for Dickinson, North Dakota.
2. The decommissioning estimate is based on details and equipment defined through conversations and documentation provided by ACE.
3. An offsite landfill is assumed to be used for proper disposal of demolition waste. Based on discussions with the Mercer County Regional Landfill, the cost for disposal of inert debris is $31.00 per ton. The hauling distance to this landfill is approximately 33 miles from the Project site.
4. Fluids located within the turbine nacelle, including oils, fuels, solvents, and process chemicals, are assumed to be drained and disposed of offsite as part of the decommissioning.
5. Estimates are presented with and without the salvage value of the equipment included, as required by NDAC section 69-09-09-06-3b.
6. Where applicable, scrap values are based upon an average of monthly American Metal Market prices for August 2018 through July 2019 (i.e., one calendar year). These values include the cost to haul the scrap via truck and/or rail to the major market which provides the best price. Based on hauling and rail prices, the best market at the time of this Study was Chicago. Prices used include:
   a. Steel scrap value is $208.10 per net ton.
   b. Copper scrap value is $2.00 per pound.
   c. Aluminum scrap value is $0.31 per pound.
7. It is assumed that all containers and chemical storage tanks owned by the Project will be drained and the material disposed of prior to demolition; these costs are excluded from the estimate.
8. Collector cables are expected to be buried at a minimum depth of 4 feet below grade. At this depth, all cables can be abandoned in place per the NDAC.
9. All foundations and underground equipment will be removed to a depth of 4 feet. All non-hazardous structures or foundations greater than each county's respective requirements below grade will remain and are excluded from the decommissioning estimate.

10. Parking areas, storage yards, crane pads, and all other areas constructed from asphalt, concrete, gravel, or compactable fill will be removed, recycled, and reclaimed.
11. It is assumed that all disturbed areas will be restored to original grade, reclaimed with native soils, seeded, and replanted with native vegetation consistent with the surrounding land use.
12. The Project laydown yard that was utilized during the construction of the Project was assumed to be previously reclaimed and restored; no further grading, seeding, or other restoration of the laydown yard was added to this estimate.
13. Cost estimates include 5 percent indirect costs and 10 percent contingency.
14. Market conditions may result in cost variations at the time of contract executions.

4.0 STATEMENT OF LIMITATIONS

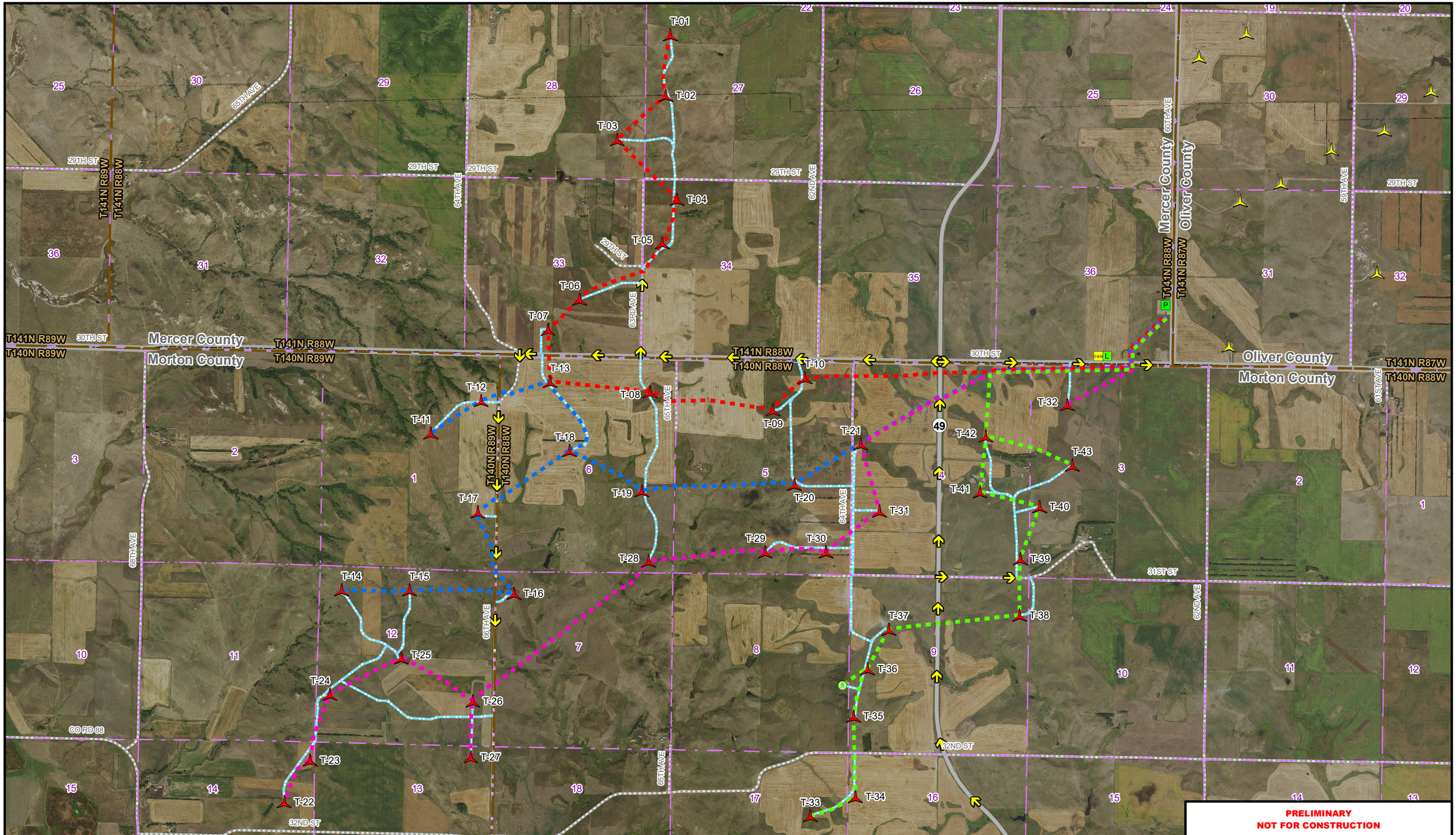
In preparation of this report, Burns & McDonnell has relied upon information provided by ACE and other third-party sources. While Burns & McDonnell has no reason to believe that the information provided to Burns & McDonnell, and upon which Burns & McDonnell has relied, is inaccurate or incomplete in any material respect, Burns & McDonnell has not independently verified such information and cannot guarantee or warranty its accuracy or completeness.

Burns & McDonnell's estimates, analyses, and recommendations contained in this report are based on professional experience, qualifications, and judgement. Burns & McDonnell has no control over weather; cost and availability of labor, material and equipment; labor productivity; energy or commodity pricing; demand or usage; population demographics; marked conditions; changes in technology; and other economic or political factors affecting these estimates, analyses, and recommendations. Therefore, Burns & McDonnell makes no guarantee or warranty (actual, expressed, or implied) that actual results will not vary from the estimates, analyses, and recommendations contained herein.

Estimates provided herein were prepared based on current knowledge of site conditions, current regulations, and current material classifications. Burns & McDonnell has no evidence or reason to believe that the cost estimate will be inaccurate at the end of the Project's useful life; however, Burns & McDonnell's estimates do not include allowances for unforeseen environmental liabilities associated with unforeseen events not considered part of normal operations. Estimates also do not include allowances for environmental remediation associated with changes in classification of materials.

This report is for the sole use, possession, and benefit of ACE for the limited purpose as provided in the agreement between ACE and Burns & McDonnell. Any use or reliance on the contents, information, conclusions, or opinions expressed herein by any other party of for any other use is strictly prohibited and is at the party's sole risk. Burns & McDonnell assumes no responsibility or liability for any unauthorized use.

APPENDIX A – SITE LAYOUT AND CONFIGURATION



LEGEND

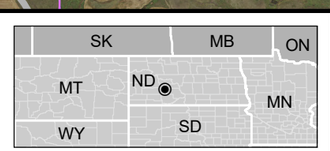
- Proposed Wind Turbines
- Existing Wind Turbines
- O& M Building
- Proposed Met Tower
- Feeder 1
- Feeder 2
- Feeder 3
- Feeder 4
- POI (Tri-County Sub)
- Laydown Yard
- Access Road
- Turbine Delivery Route
- Section Line
- Township and Range Line
- County Boundary
- County Road
- Highway

REFERENCE

0 0.5 1 Miles

0 0.5 1 Kilometers

N



PRELIMINARY
NOT FOR CONSTRUCTION

GLEN ULLIN ENERGY CENTER I
Wind Project

LOCATION:	Morton and Mercer Counties, North Dakota
CLIENT:	ALLETE Clean Energy
PROJ. NO.:	109384
CREATED:	6/7/2019

ALLETE clean energy

Path: Z:\Clients\BTS\AlleteCleanE\109384_CleanEnergy\10ES\Studies\Geospatial\DataFiles\ArcDocs\GUEC_11x17_Landscape_PublicMap\v2.mxd • Coordinate System: NAD 1983 StatePlane North Dakota South FIPS 3302 • Units: Meter

APPENDIX B – DECOMMISSIONING COST BREAKDOWN

Table B-1: Estimated Cost for Wind Turbine Decommissioning (2019$)

Wind Turbine Removal Cost		
Removal	$	1,929,000
Hauling & Disposal	$	177,000
Total	**$**	**2,106,000**
Scrap Value	**$**	**(3,297,000)**
Wind Turbine Foundation Removal Cost		
Removal	$	170,000
Hauling & Disposal	$	158,000
Total	**$**	**328,000**
Collection System Removal Cost		
Removal	$	28,000
Total	**$**	**28,000**
Substation Removal Cost		
Removal	$	409,000
Hauling & Disposal	$	29,000
Total	**$**	**438,000**
Scrap Value	**$**	**(80,000)**
Civil Works Removal Cost		
Removal	$	233,000
Hauling & Disposal	$	1,342,000
Grading & Seeding Costs	$	122,000
Total	**$**	**1,697,000**
O&M Facility Removal		
Removal	$	31,000
Hauling & Disposal	$	10,000
Total	**$**	**41,000**
Scrap Value	**$**	**(7,000)**
Met Tower Removal		
Removal	$	10,000
Hauling & Disposal	$	2,000
Total	**$**	**12,000**
Scrap Value	**$**	**(2,000)**
Other Costs		
Oils & Chemicals Removal & Disposal	$	58,000
Total	**$**	**58,000**
Total Estimated Cost	**$**	**4,708,000**
Owner Indirects (5%)	**$**	**235,400**
Contingency (10%)	**$**	**470,800**
Total Gross Cost	**$**	**5,414,200**
Total Scrap Value	**$**	**(3,386,000)**
Total Net Cost	**$**	**2,028,200**

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Burns & McDonnell World Headquarters
9400 Ward Parkway
Kansas City, MO 64114
O 816-333-9400
F 816-333-3690
www.burnsmcd.com