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June 30, 2018

VIA EMAIL and U.S. MAIL
Mr. Darrell Nitschke
Executive Secretary
North Dakota Public Service Commission
600 E. Boulevard Ave., Dept. 408
Bismarck, North Dakota 58505-0480

RE: Wind Decommissioning – Compliance
Case No. PU-17-251

Dear Mr. Nitschke:

In compliance with the North Dakota Public Service Commission's December 28, 2017 Notice Regarding Compliance with Decommissioning Rules in the above-referenced Docket, ALLETE Clean Energy hereby provides an original and copy of its decommissioning plan and cost estimate for its Thunder Spirit II Wind Project.

If you have any questions, please do not hesitate to contact me at the number above.

Yours truly,

David R. Moeller

DRM:sr
Enc.
cc: Jim Moran

BURNS McDONNELL

Decommissioning Plan and Decommissioning Obligation Cost Evaluation

ALLETE clean energy™

ALLETE Clean Energy

Thunder Spirit II Wind Project
BMcD Project No. 102304

06/25/2018

Decommissioning Plan and Decommissioning Obligation Cost Evaluation

prepared for

ALLETE Clean Energy
Thunder Spirit II Wind Project
Adams County, North Dakota

BMcD Project No. 102304

06/25/2018

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, LLC
BMPs	Best management practices
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
kV	Kilovolt
MW	Megawatt
O&M	Operations and maintenance
NDAC	North Dakota Administrative Code
Project	Thunder Spirit II Wind Project
Project Site	Location of the Project in Adams County, North Dakota
Study	Decommissioning Plan / Decommissioning Obligation Cost Evaluation
TSW1	Thunder Spirit I Wind Project
TSW2	Thunder Spirit II Wind Project

1.0 EXECUTIVE SUMMARY

1.1 Introduction

Burns & McDonnell was retained by ALLETE Clean Energy to conduct a decommissioning obligation cost evaluation for the Thunder Spirit II Wind Farm. The purpose of this decommissioning cost evaluation was to review the Project and provide a recommendation regarding the decommissioning cost and plan for retiring the facility at the end of its useful life.

The Project is located in Adams County, North Dakota, approximately 150 miles southwest of Bismarck, North Dakota. As the second phase of the existing Thunder Spirit Wind Farm, the Project will consist of 16 Nordex N117-3000 turbines that combine to have a nominal rating of 48 megawatts. The Project is expected to begin commercial operation in 2018.

1.2 Results

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. However, the Project will also 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 development of the Project. Included are the costs to retire the power generating equipment that is a part of the Project, as well as the costs to retire the Project's balance-of-plant facilities, with all equipment, structures, and supporting facilities removed to a depth of four (4) feet below grade in accordance with the NDAC.

The Project shares some common facilities with Phase 1 of Thunder Spirit Wind Farm, including a collector substation, transmission line, O&M building, and storage building. The decommissioning costs for these shared facilities were included in the cost evaluation and allocated to the Project based on its nominal capacity (48 MW) in relation to that of TSW1 (107.5 MW). Based on this split, approximately 31 percent of the shared facility costs were allocated to TSW2.

The total cost to decommission this Project at the end of its useful life, based on the assumptions noted herein, is estimated to be approximately $260,400.

2.0 INTRODUCTION

2.1 Study Overview

Burns & McDonnell Engineering Company, Inc. ("Burns & McDonnell") was retained by ALLETE Clean Energy ("ACE") to conduct a decommissioning obligation cost evaluation (the "Study") for the Thunder Spirit II Wind Farm (the "Project"). The purpose of this decommissioning cost evaluation was to review the Project and provide a recommendation regarding the decommissioning cost and plan for retiring the facility at the end of its useful life.

The Project is located in Adams County, North Dakota, approximately 150 miles southwest of Bismarck, North Dakota. As the second phase of the existing Thunder Spirit Wind Farm, the Project will consist of 16 Nordex N117-3000 turbines that combine to have a nominal rating of 48 megawatts ("MW"). The Project is expected to begin commercial operation in 2018.

2.2 Documents Reviewed

Project-specific documentation reviewed by Burns & McDonnell in the completion of the Study was provided by ACE.

2.3 Organization of Report

This report is organized into several separate chapters and supporting appendices. These individual sections are listed below, along with a brief description of their contents.

- **Section 1.0 - Executive Summary:** An executive summary of the Study.
- **Section 2.0 - Introduction:** A description of the Study's objectives, the documents reviewed by Burns & McDonnell in the completion of the Study, and the structure of this report.
- **Section 3.0 - Project Overview:** An overview of the Project and noteworthy characteristics of the Project Site.
- **Section 4.0 - Decommissioning:** Summary of the decommissioning plan and associated costs for the Project, including noteworthy assumptions.
- **Section 5.0 - Certification:** Certification of the Professional Engineer.

3.0 PROJECT OVERVIEW

3.1 Project Summary

The Project is located in Adams County, North Dakota, near the town of Hettinger, North Dakota. At the time of this writing, the Project was under construction, with an anticipated commercial operation date of 4Q2018. The Project will consist of 16 Nordex N117-3000 turbines with a hub height of 91 meters. The overall Project configuration that was used as the basis for this Study is shown in Appendix B.

The Project shares some common facilities with Phase 1 of Thunder Spirit Wind Farm, including a collector substation, transmission line, O&M building, and storage building. The decommissioning costs for these shared facilities were included in the cost evaluation and allocated to the Project based on its nominal capacity (48 MW) in relation to that of TSW1 (107.5 MW). Based on this split, approximately 31 percent of the shared facility costs were allocated to TSW2.

The contents of this evaluation, including conclusions provided herein, are based exclusively upon desktop analysis.

3.2 Project Facilities

The following sections provide an overview of the Project facilities.

3.2.1 Wind Turbines

The Project consists of a quantity of 16 Nordex N117-3000 turbines. The 3-MW turbines include 91-meter, conical, tubular, steel towers which support the turbine nacelles mounted on top. The nacelle of each turbine includes three (3) blades mounted to the nacelle rotor, each with a total rotor diameter of 116.8 meters. All turbines were assumed to be fully removed as a part of this Study.

3.2.2 Wind Turbine Foundations

Each wind turbine tower will be supported by a cylindrical concrete pedestal on top of a sloped, octagonal concrete spread footing, as is commonly used throughout the wind industry. Issued-for-construction foundation drawings specific to the Project were provided by ACE and used for the basis of this Study. The circular concrete pedestal is 20 feet in diameter and has a below-grade depth of 4.67 feet. The sloped, octagonal concrete base beneath the pedestal extends downward an additional 5.17 feet. It has a top diameter of approximately 24.83 feet and a bottom diameter of 60 feet. The total foundation depth is approximately 10.83 feet below grade.

All underground facilities for the Project will be removed to a depth of four (4) feet below grade in accordance with the North Dakota Administrative Code ("NDAC"). Thus, the top four (4) feet of the pedestal will be removed and backfilled as part of the decommissioning, and the remaining foundation will be left in place.

3.2.3 Site Roads

Each wind turbine will have an access road to support construction and allow for vehicle access to facilitate inspections and maintenance of the turbines and associated equipment during operation. According to issued-for-construction drawings provided by ACE, the access roads will be 16 feet wide and consist of a six (6)-inch layer of crushed gravel that rests on compacted subgrade. The Study accounts for removal of approximately 35,138 linear feet of access road. All public / county roads were assumed to remain in place after decommissioning and were not considered as part of this Study.

3.2.4 Collection System

Each wind turbine generates three-phase electrical power that is transformed to 34.5 kilovolts ("kV") with an oil-filled, medium-voltage transformer located adjacent to the base of the turbine. All such transformers were assumed to be removed as part of this Study.

The Project will include an underground 34.5-kV electrical power collection system that will collect the electrical power from the wind turbines and route it to a collector substation. Issued-for-construction drawings of this underground collection system indicated that all cables will be buried at a minimum below-grade depth of 42 inches. At this depth, all cables (including both power and communication cabling) will be abandoned in place when the Project is decommissioned as they are buried deeper than the NDAC-required underground cable removal depth of two (2) feet.

3.2.5 Collector Substation

Power from each wind turbine is delivered via underground power collection circuits to an on-site collector substation, where it is transformed from 34.5 kV to 230 kV via one (1) main power transformer. Issued-for-construction drawings were provided by ACE for this substation, which includes one (1) control building, six (6) medium-voltage breakers, one (1) high-voltage breaker, one (1) dead-end structure, and other ancillary equipment. All above-grade equipment within the perimeter fence of the substation, below-grade equipment to a depth of four (4) feet, and all underground cables to a depth of two (2) feet were assumed to be removed as part of the Study, in accordance with NDAC requirements.

3.2.6 Interconnection Line

Output from the Project is delivered to the point of interconnection through an approximately 0.56-mile, 230-kV, overhead transmission line. All above-grade equipment for this line, including structures and cabling and all below-grade equipment to a depth of four (4) feet were assumed to be removed as part of the Study. According to as-built drawings provided by ACE, this transmission line includes four (4) structures, including two (2) H-frame tangent structures and two (2) 3-pole inline structures; the dead-end structure at the Project collector substation was also removed, although the dead-end structure at the Hettinger interconnection switchyard owned by MDU was not included in this Study.

3.2.7 Maintenance/Warehouse Facility

The Project includes an on-site operations and maintenance ("O&M") building, consisting of offices, spare parts storage, and an area for minor maintenance. This 100-foot by 40-foot building is considered a shared facility between TSW1 and the Project. This structure, as well as the surrounding gravel and six (6) foot high perimeter chain-link fence, is assumed to be decommissioned and removed as a part of this Study.

The Project also includes an on-site storage facility. This is an 80-foot by 40-foot metal building that has 16-foot-high finished walls. The design requirements include a concrete foundation with a minimum thickness of six (6) inches under the entire building. This building and its foundation were removed as part of this Study.

3.2.8 Meteorological Equipment

One (1) meteorological tower is assumed to be installed at the Project site. The tower was assumed to be a permanent, free-standing, hub-height lattice-type tower. The tower was assumed to be fully removed as part of this Study, including its supporting foundation.

4.0 DECOMMISSIONING

4.1 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, and other Project facilities, 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 nacelle using a crane, cut into manageably-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. The towers and nacelle will then be dismantled, cut onsite, and hauled off to a scrap yard.

All concrete wind turbine foundations will be removed to a depth of four (4) feet below grade; the portions of the foundation that are greater than four (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 footings will be backfilled with surrounding subsoil and topsoil and fine graded to provide suitable drainage.

The Project substation will be removed from the site, including all above-grade equipment (e.g., transformers, breakers, busbars), buildings, crushed rock surfacing, and fencing. All below-grade equipment (e.g., foundations) will be removed to a depth of four (4) feet below grade.

All crushed rock surfacing will be removed from the Project's access roads. The removed crushed rock will be loaded into dump trucks and hauled offsite for disposal. The cost to remove the crushed rock, load it into dump trucks, and haul it to the final destination (assumed to be within 10 miles of the Project) will be at the expense of the Project, at which point the ownership of the crushed rock will be transferred to a third party.

Following the removal of crushed rock surfacing, a layer of topsoil will be added to replace the removed rock. The areas where crushed rock has been removed will be fine graded to provide suitable drainage. In right-of-way and non-agricultural areas, the ground will be seeded to prevent erosion.

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 ("BMPs") 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 water 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 agricultural 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 decommissioning of the Project.

The activities associated with the decommissioning plan described above are anticipated to be completed within a six (6) 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.

4.2 Decommissioning Costs

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 $260,400 or $16,275 per turbine; a detailed breakdown of these costs is included in Appendix A. 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.

4.3 Decommissioning Assumptions

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

1. All costs are presented in current (2018) dollars using the nearest site cost index from Dickinson, North Dakota.
2. The decommissioning estimate is based on details and equipment defined through conversations with and documentation provided by ACE.
3. An offsite landfill is assumed to be used for disposal of demolition waste. Dickinson City Landfill, which is approximately 70 miles from the Project Site, provided a rate of $36 per ton as a tipping fee, a typical disposal rate for projects of this scale.
4. Where applicable, scrap values are based upon an average of monthly American Metal Market prices for June 2017 through May 2018 (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, Illinois. Prices used include:
   a. Steel scrap value is $258.41 per net ton.
   b. Copper scrap value is $2.24 per pound.
   c. Aluminum scrap value is $0.45 per pound.
5. 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 demolition; these costs are included in the estimate.
6. It is assumed that all chemicals and consumables in storage and owned by the Project will be drained and the material disposed of prior to demolition; these costs are excluded from the estimate.
7. In accordance with North Dakota Administrative Code (NDAC 69-09-09-05 Decommissioning Requirements), all underground cables will be removed to a depth of two (2) feet below grade; all other equipment will be removed to a depth of four (4) feet below grade. All non-hazardous structures or foundations greater than four (4) feet below grade will remain and are excluded from the decommissioning estimate.
8. Access roads, parking areas, storage yards, crane pads, and all other areas constructed from asphalt, concrete, gravel, or compactable fill will be removed, recycled, and reclaimed.
9. Crushed rock from roads, balance-of-plant areas, and turbine foundation areas is assumed to have value as a commodity for reuse by a third party (e.g., demolition contractor, local landowner, municipality). The cost to remove the crushed rock, load it into dump trucks, and haul it an average of

10 miles will be at the expense of the Project; however, it is assumed the third party will accept the crushed rock at no charge. Therefore, cost of disposal is excluded from the estimate.

10. Costs for grading and seeding have been included in the decommissioning cost estimate.
11. Waste material and crushed concrete will be properly disposed of offsite.
12. It is assumed that all Project-specific access roads, fences, gates, and buildings will be removed as part of the decommissioning. Additionally, disturbed areas will be restored to original grade, reclaimed with native soils, seeded, and replanted with native vegetation consistent with surrounding land use.
13. One meteorological tower was assumed to exist at a height similar to the wind turbine hub height. This tower was assumed to be fully removed as part of this Study.
14. Transformers will be removed and processed on-site. The cost to drain and dispose of transformer oil off-site is included in the decommissioning cost estimate.
15. The Project laydown yard that was utilized during construction of the Project was assumed to be previously reclaimed and restored; no further grading, seeding, or other restoration of the laydown yard was included in this estimate.
16. All weights provided on the Nordex N117-3000 turbine datasheet were assumed to be metric tons.
17. All shared facilities costs were allocated to the Project (48 MW project) based on the scale in comparison to TSW1 (107.5 MW project). Therefore, the Project was assumed to incur costs for 48/155.5 (30.87%) of the total decommissioning costs for shared facilities.
18. Cost estimates include five (5) percent indirects and ten (10) percent contingency.
19. Market conditions may result in cost variations at the time of contract execution.

4.4 Statement of Limitations

In preparation of this report, Burns & McDonnell has relied upon information provided by ALLETE Clean Energy 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 warrant its accuracy or completeness.

Burns & McDonnell's estimates, analyses, and recommendations contained in this report are based on professional experience, qualifications, and judgment. 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; market conditions; changes in technology; and other economic or political factors affecting such 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 and 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 and 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 ALLETE Clean Energy for the limited purpose as provided in the agreement between ALLETE Clean Energy and Burns & McDonnell. Any use or reliance on the contents, information, conclusions, or opinions expressed herein by any other party or for any other use is strictly prohibited and is at that party's sole risk. Burns & McDonnell assumes no responsibility or liability for any unauthorized use.

5.0 CERTIFICATION

I certify, as a Professional Engineer in the state of North Dakota, that the information presented in this report was assembled under my direct personal charge, is an accurate representation of the anticipated decommissioning costs for the Thunder Spirit II Wind Project, subject to the assumptions and limitations presented herein, and that this report contains no intentional false statements or misrepresentations.

APPENDIX A - DECOMMISSIONING COST BREAKDOWN

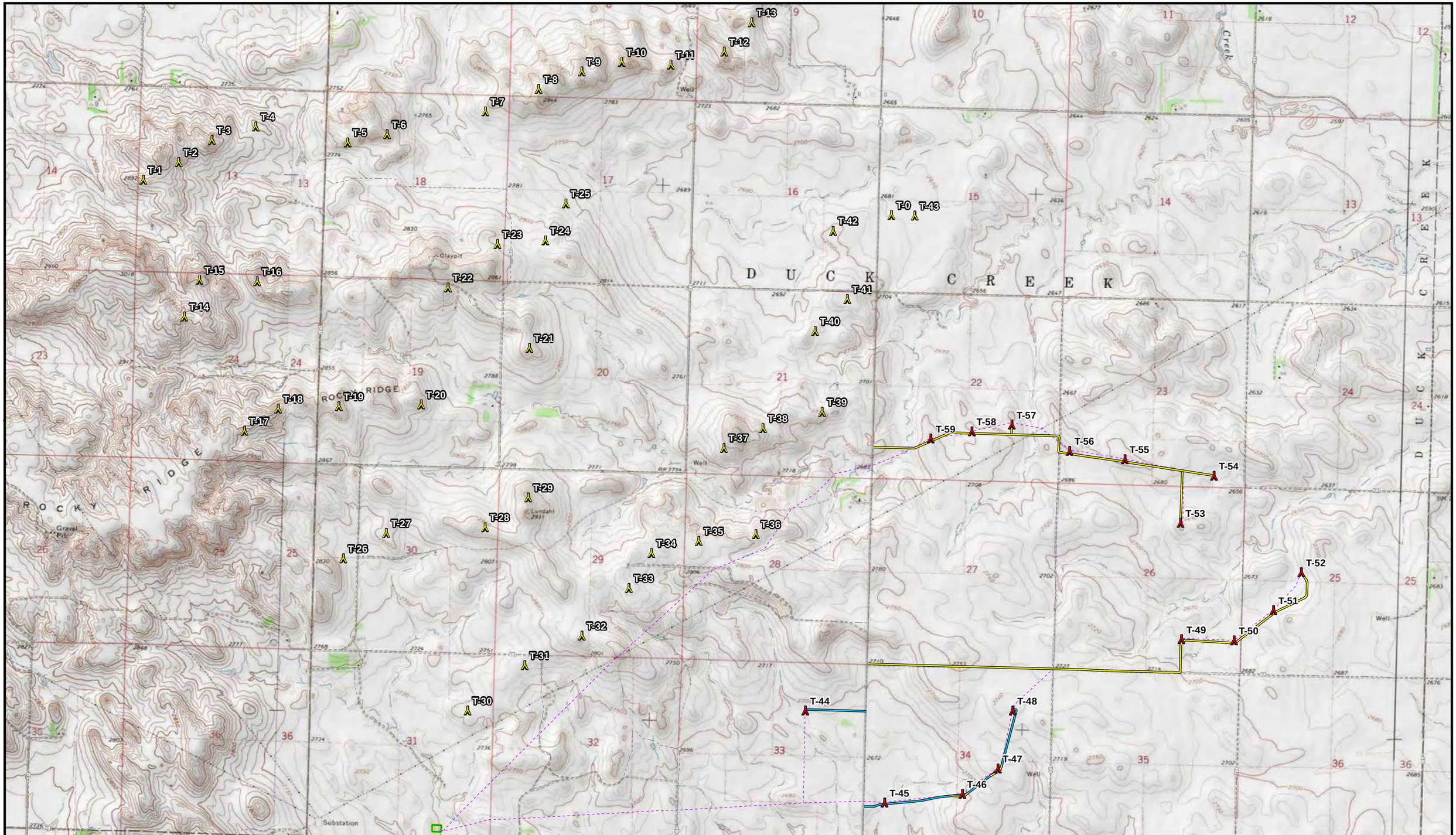
Table A-1: Estimated Decommissioning Costs (2018$)

Thunder Spirit 2 Wind Farm Wind Project

Decommissioning Cost Evaluation

Wind Turbine Removal Cost		
Removal	$	951,000
Hauling & Disposal	$	91,000
Total	**$**	**1,042,000**
Scrap Value	**$**	**(1,513,000)**
Wind Turbine Foundation Removal Cost		
Removal	$	88,000
Hauling & Disposal	$	122,000
Total	**$**	**210,000**
Substation Removal Cost		
Removal	$	49,000
Hauling & Disposal	$	4,000
Total	**$**	**53,000**
Scrap Value	**$**	**(30,000)**
Transmission Line Removal Cost		
Equipment Removal	$	3,000
Total	**$**	**3,000**
Scrap Value	**$**	**(2,000)**
Civil Works Removal Cost		
Crushed Rock Surfacing Removal	$	80,000
Hauling & Disposal	$	101,000
Grading & Seeding Costs	$	53,000
Total	**$**	**234,000**
O&M Facility Removal		
O&M Removal	$	12,000
Hauling & Disposal	$	7,000
Total	**$**	**19,000**
Scrap Value	**$**	**(6,000)**
Met Tower Removal		
Tower Removal	$	7,000
Total	**$**	**7,000**
Scrap Value	**$**	**(1,000)**
Other Costs		
Hazardous Material Removal & Disposal	$	8,000
Total	**$**	**8,000**
Total Estimated Cost	**$**	**1,576,000**
Owner Indirects (5%)	**$**	**78,800**
Contingency (10%)	**$**	**157,600**
Total Gross Cost	**$**	**1,812,400**
Total Scrap Value	**$**	**(1,552,000)**
Total Net Cost	**$**	**260,400**

APPENDIX B - SITE LAYOUT AND CONFIGURATION



LEGEND

- Turbine, TSWI
- Turbine, TSWII
- Collector Substation
- Collection System Cabling
- Access Road
- Access Road, PTC Road
- Existing Road

REFERENCE

0 0.25 0.5
MILES
0 0.25 0.5
KILOMETERS

N

SK MB MT ND MN SD

THUNDER SPIRIT WIND FARM
Project Layout

LOCATION:	Adams County, North Dakota
CLIENT:	ALLETE Clean Energy
PROJ. NO.:	102304
CREATED:	06/18/2018

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Path: \\bmcdfs\Clients\BTS\AlleteCleanE\102304_TSW2OE\Studies\Geospatial\DataFiles\ArcDocs\102304_ThunderSpirit.mxd • Coordinate System: NAD 1983 StatePlane North Dakota South FIPS 3302 Feet • Units: Foot US

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