Planning Commission Meeting Agenda
Regular Scheduled Meeting Thursday, February 8, 2018– 6:30PM
CITY HALL COUNCIL CHAMBERS 300 CHIEF EDDIE HOFFMAN HIGHWAY

MEMBERS

Kathy Hanson
Chair
Term Expires 12/2018

Lorin Bradbury
Vice-Chair
Term Expires 12/2020

John Guinn
Commission Member
Term Expires 12/2019

Jon Cochrane
Commission Member
Term Expires 12/2018

Alex Wasierski
Commission Member
Term Expires 12/18

Shadi Rabi
Commission Member
Term Expires 12/19

Elizabeth Williams
Alternate Member
Term Expires 12/2020

Scott Campbell
Alternate Member
Term Expires 1/2020

Thor Williams
Council Representative
Term Expires 10/19

Betsy Jumper
Ex-Officio Member

Pauline Boratko
Recorder

AGENDA

I. CALL TO ORDER

II. ROLL CALL

III. PEOPLE TO BE HEARD – (5 Minute Limit)

IV. SPECIAL ORDER OF BUSINESS:

V. APPROVAL OF THE AGENDA:

VI. APPROVAL OF THE MINUTES:
A. Regular Meeting- January 11, 2018

VII. NEW BUSINESS:
A. PUBLIC HEARING: Request for Special Use Permit- The City of Bethel Planning Office received a request for a public hearing for the placement and construction for a tall tower for the Bethel Wind Project. This area is underdeveloped land that is west of Old BIA Road, about 0.3 miles southwest of the BIA Administrative Site and approximately 1.2 miles west of the Bethel Airport. Land Owner: Bethel Native Corporation, P.O. Box 719, Bethel, Alaska. 99559. Contact: Ana Hoffman, 543-2124. Applicant: Alaska Village Electric Cooperative, 4831 Eagle Street, Anchorage, Alaska. 99503 Contact: Forrest Button 561-1818

VIII. PLANNER'S REPORT

IX. COMMISSIONER'S COMMENTS

X. ADJOURNMENT

Posted February 2, 2018 at City Hall, Post Office, Bethel Native Corp. and Swanson's Grocery Store Bulletin Boards

City of Bethel, Alaska
Planning Commission

January 11, 2018 Regular Meeting Bethel, Alaska

I. CALL TO ORDER:

A regular meeting of the Planning Commission was held on January 11, 2018 at the City of Council Chambers in Bethel, Alaska. Co-Chair Lorin Bradbury called the meeting to order at 6:35 PM.

II. ROLL CALL:

Compromising a quorum of the Commission, the following members were present for roll call: Lorin Bradbury, Jon Cochrane, Shadi Rabi and Thor Williams.
Excused Absence: John Guinn
Unexcused Absence: Kathy Hanson and Alex Wasierski
Also present: City Planner, Betsy Jumper

III. PEOPLE TO BE HEARD: No one wished to be heard

IV. SPECIAL ORDER OF BUSINESS:

A. Electing Chair and Vice-Chair of the Commission

MOVED:	John Cochrane	Motion to re- elect Kathy Hanson for Chair of the Planning Commission.
SECONDED:	Shadi Rabi	
VOTE ON MOTION	Unanimous	

MOVED:	Jon Cochane	Motion to re-elect Lorin Bradbury for Vice-Chair of the Planning Commission.
SECONDED:	Shadi Rabi	
VOTE ON MOTION	Unanimous	

V. APPROVAL OF THE AGENDA:

MOVED:	Jon Cochrane	Motion to approve the agenda.
SECONDED:	Thor Williams	
VOTE ON MOTION	Unanimous	

VI. APPROVAL OF THE MINUTES:

MOVED:	John Guinn	Motion to approve the November 9, 2017 meeting minutes
SECONDED:	Jon Cochrane	
VOTE ON MOTION	Unanimous	

VII. NEW BUSINESS:

VII. PLANNER'S REPORT: Betsy Jumper gave her report and informed the commissioners of the upcoming meetings.

VIII. COMMISSIONER'S COMMENTS:

L. Bradbury- no comment.
S. Rabi- no comment
J. Cochrane- no comment.
T. Williams- no comment

IX. ADJOURNMENT:

MOVED:	Jon Cochrane	Motion to adjourn the meeting.
SECONDED:	Thor Williams	
VOTE ON MOTION	Unanimous	

With no further business the meeting adjourned at 6:50pm

APPROVED THIS _____ DAY OF _____, 2018

_____ _____

ATTEST: Pauline Boratko, Recorder Lorin Bradbury, Co- Chair

DRAFT

MEMO

TO THE PLANNING COMMISSION

RE: City Planner Report for February 8, 2018 Planning Commission Meeting – **Bethel Wind Project**

Applicant: Alaska Villages Electrical Cooperative and the Bethel Corporation Renewable Energy Joint Venture (ARBE)

Property Owner: Bethel Native Corporation

Request: A request for a Public Hearing for a Special Use Permit in accordance with Bethel Municipal Code 16.10 to construct a 50-meter, 900-kilowatt wind turbine to improve the energy supply in Bethel and two other adjoining communities, Napakiak and Oscarville.

Location: The wind turbine would be placed in an undeveloped area that is west of old BIA road, about 0.3 miles southwest of the BIA Administrative Site, and approximately 1.2 miles west of the Bethel Airport.

Size of Area: 7.98 acres.

Narrative: The City of Bethel Planning Dept. received a Request for a Public Hearing Application from AVEC/Bethel Native Corporation Renewable Energy Joint Venture (ARBE) partnership on November 7, 2017 as required by Bethel Ordinance #15-27 for a Special Use Permit for the placement and construction of a tall tower for the Bethel Wind Project. Construction to build a pad and access road was granted by the Planning Commission during the special meeting on Oct. 19th, 2017. This area is not zoned and the site is outside of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) area. The final application arrived on January 3, 2018.

Per BMC 16.10.140 – Planning Director's Review—A. *"The Planning Director shall review the application for completeness and shall notify the applicant within twenty (20) calendar days of receipt of the initial submission whether the application is deemed complete". The* application for a special use permit and tall towers was submitted to the Planning Dept. on Jan. 3, 2018, hence the hearing set for February 8th. Applicant was notified. B. *"Incomplete applications…."* (not applicable). C. *"Once an application is deemed complete, the planning director shall schedule a hearing….."* Yes, Feb. 8, 2018. D.*"Public notice of planning commission consideration of a special use permit request for a new tall structure, at a minimum, shall be provided as follows: note that "√" indicates the step has been done.*

- ✓ *1. Permit consideration must be included as an item in the posted agenda;*
- ✓ *2. Notice of the hearing and the agenda item must be published in a newspaper of general circulation in the city a minimum of ten (10) calendar days prior to the date of the meeting. The cost of publication will be paid by the applicant. Publication will be accomplished by the planning director.*
- ✓ *3. The planning director or their designee shall post copies of the agenda showing the request for a special use permit, on at least three (3) bulletin boards accessible to the general public. Posting will be done at least five (5) calendar days prior to the scheduled hearing.*
- ✓ *4. The applicant shall post signs on the proposed site at least fourteen (14) calendar days prior to the hearing at locations determined by the planning director. The sign must be between four (4) square feet and thirty-two (32) square feet in area, must have a red background, and must indicate in white lettering, two-hundred-sixteen (216) point or larger, that a special use permit for a tall structure has been sought for the site, the date of the hearing thereon, and that further information is available from the city's planning director. The applicant must maintain the sign and shall remove it within fourteen (14) calendar days after final action on the application.*
- ✓ *5. The planning director shall mail notice of the application and the public hearing to the owners of record of all property located within one thousand five hundred (1500) feet of the site and all individuals who submitted comments at the community meeting. The actual cost of the mailing will be paid by the applicant (ord. 15-27 §. 3)*

Bethel Comprehensive Plan: Per Chapter 7 of the Bethel Comprehensive Plan 2011, "New/Alternative Energy Sources" Goal 3 addresses how the City can speed the day when alternatives are able to provide a longer-term, commercially viable alternative to reliance on diesel fuel.

New/Alternative Energy Sources

GOAL 3: Develop new, alternative energy sources and innovative methods to reduce the cost of energy.
Strategy 1: Develop new energy sources, such as solar panels, wind turbines, hydroelectric power, and natural gas, as feasible.
Action1a: Develop new City policy to guide the placement and operation of wind turbines to ensure the safety and quiet enjoyment of the community.
Action 1b: Work with the electric utility to understand the capacity of Bethel's electric generation and transmission infrastructure to accommodate alternative energy sources, and also to determine the most appropriate levels of investment in various alternative energy sources.
Action 1c: Reserve land or land development rights for alternative energy development and facilities (e.g., wind turbines, natural gas pipeline rights-of-way). *(See Land Use Goal 1.)*
Action 1d: Explore the use of innovative financing programs for renewable energy investments (e.g., Property Assessed Clean Energy or Sales Tax Assessed Clean Energy).
Policy 1e: Encourage smaller-scale private sector use of new energy technologies (e.g., wind turbines).
Strategy 2: Engage in cooperative relationships with other entities pursuing new or improved energy infrastructure in Bethel and the Yukon-Kuskokwim region.
Action 2a: Coordinate with regional partners, at a minimum to keep City and regional partners informed of each other's energy-related policies and projects. As practicable, coordinate local and regional policies and projects, including (but not limited to) options for hydro and natural gas prospects, regional wind farms, and inter-village transmission lines connecting centralized power plants.

This is compatible with the Bethel Comprehensive Plan.

City of Bethel Engineer Review: Pending.

Planner's Recommendation: The applicant turned in the final application for a Special Use permit on January 3 via regular mail. Planner's recommendation is to approve the Bethel Wind project, with the conditions, if any, of the City of Bethel Engineer's recommendations.

16.10.150 Planning commission review.

The planning commission is authorized to review, analyze, evaluate and make decisions with respect to reviewing special use permits for tall structures.

A. Process Timeframe.

1. A public hearing must be held by the planning commission within forty-five (45) calendar days of receipt of a complete application;

2. The commission shall render a written decision within thirty (30) days from the close of the public hearing.

B. The planning commission may impose conditions on a tall structure permit:

1. Required to ensure compliance with the design criteria specified in BMC 16.10.110; and

2. That are consistent with the purposes of this chapter, which may include conditions related to the aesthetic effect of the tall structure and compatibility with the surrounding area. Factors relevant to aesthetic effects are:

a. The protection of the view in sensitive or particularly scenic areas;

b. The concentration of tall structures in the proposed area; and

c. Whether the height, design, placement or other characteristics of the proposed facility could be modified to have a less intrusive visual impact.

3. Conditions for Approval. Conditions set by the planning commission for a special use permit may include, but are not limited to, the following:

a. Height limitations;

b. Increased height or structural capacity of a proposed tall structure to accommodate future collocation;

c. Mitigation of drainage concerns;

d. Tower type (monopole, lattice, guyed);

e. Color;

f. Landscaping;

g. Parking;

h. Screening;

i. Security;

j. Signage;

k. Visibility and/or camouflaging;

l. Lighting;

m. Setbacks greater than those required under the applicable zoning regulations; and

n. Any other conditions deemed appropriate to protect the public health, safety and general welfare.

C. The planning commission may deny an application for any of the following reasons:

1. Conflict with safety and safety-related code or requirement;

2. Conflict with the purpose of a specific zoning, overlay, or land use designation;

3. Presence of another approved tall structure or tall structure application within the geographic search area, which is available to the applicant;

4. The proposed site is on, or eligible to be on, the National Register of Historic Places;

5. The applicant's failure to demonstrate that no existing structure or tower can accommodate the applicant's proposed use without increasing the height of another existing tower or structure or otherwise creating a greater visual impact; or that use of other existing facilities is technically infeasible or commercially impracticable; and

6. Conflicts with the provisions of this article.

D. The planning commission shall deny any application for a tall structure in the following locations:

1. State or local wildlife refuges; and

2. In any area designated as a public park, unless screened so as to minimize visual and noise impacts, and as long as public use of the public park will not be disrupted.

E. Any and all representations made by the applicant to the planning commission on the record during the application process, whether written or verbal, will be deemed a part of the application and may be relied upon in good faith by the planning commission.

F. In granting or denying a special use permit, the planning commission shall make written findings on whether the applicant has demonstrated that:

1. The location chosen complies with the location preferences set out in BMC 16.10.050;

2. To the extent that is technically feasible and potentially available, the location of the tall structure is such that its negative effects on the visual and scenic resources of all surrounding properties have been minimized;

3. The tall structure will not interfere with the approaches to any existing airport or airfield; and

4. Granting the permit will not be harmful to the public health, safety, convenience, and welfare.

G. The planning commission's decision shall be in writing and must include written findings of fact contained in the administrative record, including without limitation any oral evidence presented at a public hearing for the tall structure.

H. If the planning commission denies a request to place, construct or modify a tall structure, the applicant may, within fifteen (15) calendar days from the postmarked date of the decision, appeal the planning commission's decision in accordance with BMC 16.10.270. [Ord. 15-27 § 3.]

ALASKA VILLAGE ELECTRIC COOPERATIVE, INC.

October 27, 2017

Betsy Jumper, Planning Director
City of Bethel
P.O. Box 1388
Bethel, Alaska 99559

RE: Bethel City Ordinance #15-27 Special Use Permit
Public Hearing Application Forms and Requirements Packet for the
Alaska Village Electric Cooperative, Inc. Bethel Wind Project

Dear Ms. Jumper:

With this letter, the Alaska Village Electric Cooperative, Inc. (AVEC) submits the Public Hearing Application materials required by Bethel City Ordinance #15-27 for a Special Use Permit for the placement and construction of a tall tower for the Bethel Wind Project. Through the AVEC/Bethel Native Corporation Renewable Energy Joint Venture (ABRE) partnership, the Bethel Wind Project would include erecting a wind turbine and constructing a building pad and access road in Bethel, Alaska.

A site plan was approved for this project during the October 19, 2017 Bethel Planning Commission special meeting, and Permit No. 17-55 was issued to AVEC on October 24, 2017.

AVEC has prepared the required materials as detailed in Ordinance #15-27, as discussed during the July 28, 2017 pre-application meeting and Bethel Wind Project site visit, and as defined in the Public Hearing Application Forms and Requirements Packet, received by Solstice Alaska Consulting, Inc, AVEC's sub-consultant, on October 3, 2017.

Please find seven copies (one original copy and six additional copies) of each of the Request for Public Hearing Checklist documents attached.

If you have questions or would like additional information, contact Anna Sattler, AVEC Community Liaison, via email at asattler@avec.org or telephone at 907-561-7972. The fee for this application has not yet been paid; please contact Ms. Sattler to inform AVEC of the cost for submitting this application once the City of Bethel has established a fee.

Sincerely,

Meera Kohler
President and CEO

4831 Eagle Street • Anchorage, Alaska 99503-7497 • (907) 561-1818 • In State (800) 478-1818 • Fax (907) 561-2388 • In State (866) 561-2388

cc: Peter Williams, City of Bethel
Patty Burley, City of Bethel
Forest Button, AVEC
Anna Sattler, AVEC
John Andrew Leman, Counsel for AVEC, Kemppel, Huffman, and Ellis, P.C.

Attachments:
Request for Public Hearing Checklist with Applicant Responses
Application Form with Applicant Request and Intent and Planning Commission Review Criteria
Visual Impact Assessment
Letter of Intent and Project Description
Narrative
Owner Authorization Form
Site Plan with Site Plan Checklist and Site Plan Permit
Design Description and Specifications
Collocation Statement
Noninterference Evidence
Migratory Bird Treaty Act Compliance
Certification of Engineers
Minimum Height Necessary Design Evidence
Public Participation Plan
Public Participation Report with Citizen Participation Forms A and B

REQUEST FOR PUBLIC HEARING CHECKLIST

This document is provided as a resource for the Applicant to assist with the Public Hearing process and preparing the application submittal package. Please note that all items are due at the same time as the application submittal. All documents must be clearly labeled. ***Incomplete packets will be returned.*** *For additional information see the attached document.*

Required Items		Number of Copies
[X] Visual Impact Assessment		One (1) original & six (6) copies
[X] Project Description/Letter of Intent		One (1) original & six (6) copies
[X] Completed Application Form w/Review Criteria [X] Identify Tower Owner/Operator [X] Design Review Criteria (if applicable)		One (1) original & six (6) copies
[X] Narrative		One (1) original & six (6) copies
[X] Owner Authorization Form		One (1) original & six (6) copies
[X] Full-Size Site Plan with Site Plan Checklist		One (1) original & six (6) copies
[X] Design Description and Specifications		One (1) original & six (6) copies
[N/A] Demonstrated Commitment to allow collocation		One (1) original & six (6) copies
[X] Evidence the proposed structure will not interfere with the approaches to any existing airfield/airport		One (1) original & six (6) copies
[X] Compliance with Migratory Bird Treaty Act		One (1) original & six (6) copies
[X] Certification(s) of Engineer(s)		One (1) original & six (6) copies
[X] Evidence the Wind Tower is Designed at the Minimum Height Necessary		One (1) original & six (6) copies
[X] Public Participation Plan		One (1) original and six (6) copies
[X] Public Participation Report (Due 20 business days prior to the Public Hearing date assigned)		One (1) original and six (6) copies

Alaska Village Electric Cooperative, Inc.
Bethel Wind Project
October 2017 Special Use Permit
Public Hearing Application

APPLICANT RESPONSES TO THE REQUEST FOR PUBLIC HEARING CHECKLIST

To ensure complete application materials submittal, annotated responses to the City of Bethel's Request for Public Hearing Checklist, as provided to the Alaska Village Electric Cooperative, Inc. (AVEC) through the Public Hearing Application Forms and Requirements packet, are provided below.

1. Completed Application Form with Review Criteria
The application form is provided, and the Tower Owner Operator is identified. As noted in the application cover letter, the payment fee will be submitted when the fee is identified. The City of Bethel Planning Commission Review Criteria form is also provided.

2. Visual Impact Assessment
The attached Visual Impact Assessment includes a written description of visual impacts, lighting, and tower base screening, and photo simulations of the structure.

3. Project Description/Letter of Intent
The Letter of Intent details the proposed use and impacts on surrounding properties, provides a list of agency authorizations, and describes project variances. Attached to the letter is a Project Description (of the proposed turbine, building pad, and access road), with an alternatives analysis and anticipated visibility impacts. Agency authorizations are described in and appended to the Letter of Intent.

4. Narrative
The Narrative summarizes how the proposed project fits within Bethel Municipal Code and states AVEC's intention of application for a Special Use Permit.

5. Owner Authorization Form
A form authorizing use of the Bethel Native Corporation's land is attached.

6. Full-Size Site Plan with Site Plan Checklist[1]
The Site Plan materials, as delivered to the City of Bethel on October 4, 2017, including: a cover letter to City of Bethel Planning Director, Betsy Jumper; the Site Plan checklist; and Site Plan

[1]Although the Site Plan was delivered to the City of Bethel on October 4, 2017, and a special meeting of the Bethel Planning Commission was scheduled for October 19, 2017 to review the materials, the information is included with this application for reference and to ensure that a complete application packet is presented.

Alaska Village Electric Cooperative, Inc.
Bethel Wind Project
October 2017 Special Use Permit
Public Hearing Application

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The Letter of Intent details the proposed use and impacts on surrounding properties, provides a list of agency authorizations, and describes project variances. Attached to the letter is a Project Description (of the proposed turbine, building pad, and access road), with an alternatives analysis and anticipated visibility impacts. Agency authorizations are described in and appended to the Letter of Intent.

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Alaska Village Electric Cooperative, Inc.
Bethel Wind Project
October 2017 Special Use Permit
Public Hearing Application

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1. **Completed Application Form with Review Criteria**
The application for is provided, and the power owner/operator is identified. As noted in the application cover letter, the payment fee will be submitted when the fee is identified by City of Bethel Planning Commission Review Criteria form is provided.

2. **Visual Impact Assessment**
The attached Visual Impact Assessment includes a written description of visual impacts, light pollution, power base screening, and photo simulations of the structure.

3. **Project Description/Letter of Intent**
The Letter of Intent details the proposed use and impacts on surrounding properties, provides a list of agency authorizations, and describes project variances. Attached to the letter is a Project Description for the proposed turbine, building pad, and access road, with an alternative analysis and anticipated visibility impacts. Agency authorizations are described in and appended to the Letter of Intent.

4. **Narrative**
The Narrative summarizes how the proposed project fits within Bethel's municipal code and serves AVEC's intention of application for a Special Use Permit.

5. **Owner Authorization Form**
A non-authorizing use of the Bethel Native Corporation's land is attached.

6. **Full-Size Site Plan with Site Plan Checklist**
The Site Plan materials, as delivered to the City of Bethel on October 4, 2017, including a cover letter to City of Bethel Planning Director, Betty Jumper, the Site Plan checklist, and Site Plan

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[1] Illustrative Site Plan was delivered in advance of Bethel on October 4, 2017, and in order to meeting of the Bethel Planning Commission. The Checklist for October 10, 2017 is reviewed materials, the information is included with the application for the Site Plan, and to ensure that a complete application packet is presented.

figures, are enclosed. Also provided is the October 18, 2017 site plan review email from DOWL, Inc., which was discussed during the October 19, 2017 Bethel Planning Commission special meeting. (The site plan was approved during the October 19 meeting.) Also attached is Site Plan Permit No. 17-55 issued on October 24, 2017.

7. Design Description and Specifications

To reduce redundancy, design information is provided within the Project Description.

8. Demonstrated Commitment to Allow Collocation

N/A.

Demonstrated commitment to allow collocation is not provided because, as written in the Letter of Intent project variances, as a wind turbine, collocation does not apply to this project.

9. Evidence Proposed Structure Will Not Interfere with Approaches to Existing Airfield/Airport

The Letter of Intent for the Federal Aviation Administration's (FAAs) Determination of No Hazard to Air Navigation for the Bethel Wind Project, which provides evidence that the proposed structure will not interfere with airfields/airports, is attached.

10. Compliance with Migratory Bird Treaty Act

The provided statement documents compliance with the Migratory Bird Treaty Act.

11. Certification(s) of Engineers

The attached, signed document confirms design standards and structural integrity.

12. Evidence the Wind Tower Is Designed at the Minimum Height Necessary

An attached statement confirms that the Bethel Wind Project proposed design meets the minimum height required for effective functioning of the proposed tower.

13. Public Participation Plan

A Public Participation Plan is provided.

14. Public Participation Report

The Public Participation Report and supporting documentation is provided including the Citizen Participation Forms A and B, the Bethel Wind Project Public Participation Report, and the Public Participation Report Appendices A through D.

1. COMPLETED APPLICATION FORM WITH REVIEW CRITERIA

CITY OF BETHEL
PUBLIC HEARING APPLICATION

FOR OFFICE USE ONLY

☐ Fee Paid

PLANNING DEPARTMENT • PO BOX 1388 • BETHEL, AK 99559

1. This page should be the first page in each of your completed application packets.
2. All responses must be legible and in ink or typed. Illegible applications will **not** be accepted.
3. Prior to signing and submitting your application, please check all information supplied on the following papers to ensure that all responses are complete and accurate. Incomplete applications will not be accepted.
4. Payment of all applicable fees must be made at the time of application. Payment may be made by company check made payable to "City of Bethel" or credit card.
5. Applications will be accepted only on the designated submittal dates between the hours of 9:00 Am and 3:30 PM.
6. If you have any questions regarding this form, please contact the Planning Department at (907) 543-5301.

Contact Information:

The Tower Owner Operator is the Alaska Village Electric Cooperative, Inc. (AVEC). AVEC will own, operate, and maintain the proposed wind tower. Contact information for Forest Button, the Project Manager for the Bethel Wind Project, is provided.

Contact Name: Forest Button, Alaska Village Electric Cooperative Telephone: 907-561-1818

Address: 4831 Eagle Street

City: Anchorage State: AK Zip Code: 99503

Fax #: 907-561-2388 Mobile #: _____

Email: fbutton@avec.org

Subject Property Information:

Address: N/A; located at lat. 60.78029, long. -161.88598; Section 15, Township 8 N., Range 72 W., Seward Meridian.

Current Zoning: The site is outside City of Bethel zoned areas. Current Use: Undeveloped.

APPLICANT REQUEST AND INTENT

What is the proposed use(s) of the property?
The property would be used to erect a 50-meter wind turbine as described in the Project Description.

For details, see the Project Description, included with this application.

Applicant Request (please itemize proposal):
This application is for a Special Use Permit Permit for the placement and construction of a tall tower for the Bethel Wind Project.

For details, see the Letter of Intent, included with this pre-application.

Applicant's Intent (*Please describe what the proposal would facilitate):*
For details, see the Project Description, included with this application.

CITY OF BETHEL PLANNING COMMISSION REVIEW CRITERIA

Applicants are encouraged to type their answers or write legibly. Illegible answers will not be accepted.

How will this proposal be compatible with surrounding properties?
By siting the turbine near existing tall towers in the community, the project keeps with the existing character of the area. The project was located away from residential development at the end of a dead-end road to reduce visual impacts.

For details, see the Visual Impact Assessment.

How will this proposal affect the use and value of the surrounding properties?
The properties that are directly adjacent to the project location will not be impacted beyond visual impacts as described and simulated in the Visual Impact Assessment.

For details, see the Visual Impact Assessment, Letter of Intent, and Project Description.

Can the property be developed for a reasonable economic use as currently zoned? Please explain why or why not.
The proposed project location is located out of the City of Bethel's zoned areas.

What would be the increase to population and traffic if the proposal were approved?
No impacts to population or traffic are anticipated.

What would be the impact to schools and utilities if the proposal were approved?
No impacts to schools are anticipated.

Stabilized energy costs are expected; due to the Power Cost Equalization Program, residents will not see energy savings on utility bills immediately but can expect long-term energy costs stabilized.

How is the proposal consistent with the City of Bethel Comprehensive Plan; particularly the Future Land Use Map?

The project meets the Comprehensive Plan's Community Vision that states: "We will invest in more stable and affordable energy supplies, and strive to guide development to reduce energy and infrastructure costs, " (Chapter 3, p. 2). It addresses a stated economic challenge, "Bethel's economic challenges and opportunities include: The high cost of energy in Bethel results in a high cost of living and of doing business, which constrains local economic growth," and provides a tool for addressing part of this challenge "Priority Economic Development implementation actions include: Take actions to stabilize energy costs (Chapter 7) and to position Bethel to remain the region's primary part (Chapter 5)... " and "...Reserve land or land development rights for alternative energy development and facilities (e.g., wind turbines, natural gas pipeline rights-of-way)," (pp. 6-9).

Are there existing or changing conditions which affect the development of the property and support the proposed request?

N/A

On a separate sheet or sheets, please provide any information or evidence that supports your request and the statements that you have provided in this application.

See the provided Public Hearing Application Forms and Requirements responding to the Request for Public Hearing Checklist.

ZONING COMMISSION REVIEW CRITERIA

Please respond to the following ONLY if you are applying for a zoning variance.

Are there extraordinary conditions pertaining to the subject property because of its size, shape, or topography? Please describe them.

N/A; the Bethel Wind Project is not applying for a zoning variance.

Would the application of the Zoning Code standards as they relate to the subject property create an unnecessary hardship? Please explain.

Are there conditions that are peculiar to the subject property? Please describe them in detail.

Would relief, if granted, cause substantial detriment to the public good or impair the purpose and intent of the Zoning Code? Please defend your response.

On a separate sheet or sheets, please provide information or evidence that supports your request and the statements that you have provided in this application.

2. VISUAL IMPACT ASSESSMENT

Alaska Village Electric Cooperative, Inc.
Bethel Wind Project
October 2017 Special Use Permit
Public Hearing Application

VISUAL IMPACT ASSESSMENT

Contents

Visual Impacts Analysis 1
Lighting 2
Tower Base Screening 2
Photo-Simulations of the Structure 3

Visual Impacts Analysis

Background

Alaska Village Electric Cooperative, Inc. (AVEC) is planning to install a new 50-meter wind turbine on the west side of Bethel (latitude 60.78029, longitude -161.88598 within Section 15, Township 8 North, Range 72 West, Seward Meridian). Some visual impacts are expected; however, the proposed location was selected to provide the least adverse visual impacts, while still being located on the community road system and near existing power lines. The proposed site is almost a mile from any residences, with the closest residence located about 0.6 miles southeast of the site.

The tower is expected to be visible from residences within an approximate three-mile radius of the site, including the following locations (Image 1).

- Kasayuli Subdivision (about 0.6 miles southeast of the proposed project area);
- Larson Subdivision (about 1.5 miles northeast);
- Tundra Ridge Subdivision (about 2.7 miles northeast);
- H-Marker Lake and nearby residences (about 2.5 miles northeast); and
- Borrow Pit Road and nearby residences (about 1.1 miles northeast).

Additional points of interest from where the project would be visible include BIA Road, Noel Polty Boulevard and Airport Road (near the Bethel Airport), the Alaska Army National Guard Readiness Center (about 0.9 miles southeast of the project), and the Veterans Memorial Cemetery (about 1.1 miles east of the project). See Image 1 for an approximate zone of visibility from the proposed turbine location.

Image 1. An approximate 3-mile radius zone of visibility surrounding the approximate proposed turbine location.

The project was sited for least adverse visual impacts by locating the turbine southwest of town at the end of a dead-end road. By locating the turbine near existing tall towers, the project sought to keep with the existing character of the area. Because the GCI/United Utilities, Inc. 64-meter (220-ft) tower and KYUK 45-meter (148-ft) tower are located in this general area, it would fit with the existing skyline features, but would be far enough from these towers to avoid propagation interference. In an area that is composed primarily of a flat, tundra landscape, these towers and the addition of a wind turbine could benefit the community by providing a visual point that could serve as a navigational aid.

Lighting

The turbine will be marked/lighted as required in the Federal Aviation Administration (FAA) Determination of No Hazard to Air Navigation, received by AVEC on September 29, 2017, and in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights – Chapters 4, 12 & 13 (Turbines). Obstruction marking and lighting will consist of white paint with orange striping and red lights located on the nacelle (near the top, where the blades attach). No other lighting would be used, and lights would not project onto surrounding properties.

Tower Base Screening

Except for where the access road would be constructed, alders and willows up to approximately 15 feet tall would obscure the tower base from Old BIA Road (Image 2). Constructing a screen around the base of the turbine is not applicable to this project and was not pursued because shrubbery provides a natural screen between the site and the road, and there would be little opportunity to see the base

from the low-traffic, dead-end road near the tower site. In addition, it is not expected that the turbine base would serve as an attractive nuisance because it does not have a lattice and is not easily climbable.

The proposed project would be installed behind the existing trees and shrubs that form a natural screen.

Image 2. Looking toward the proposed project site general area from Old BIA Road where alders screen the site base.

Photo-Simulations of the Structure

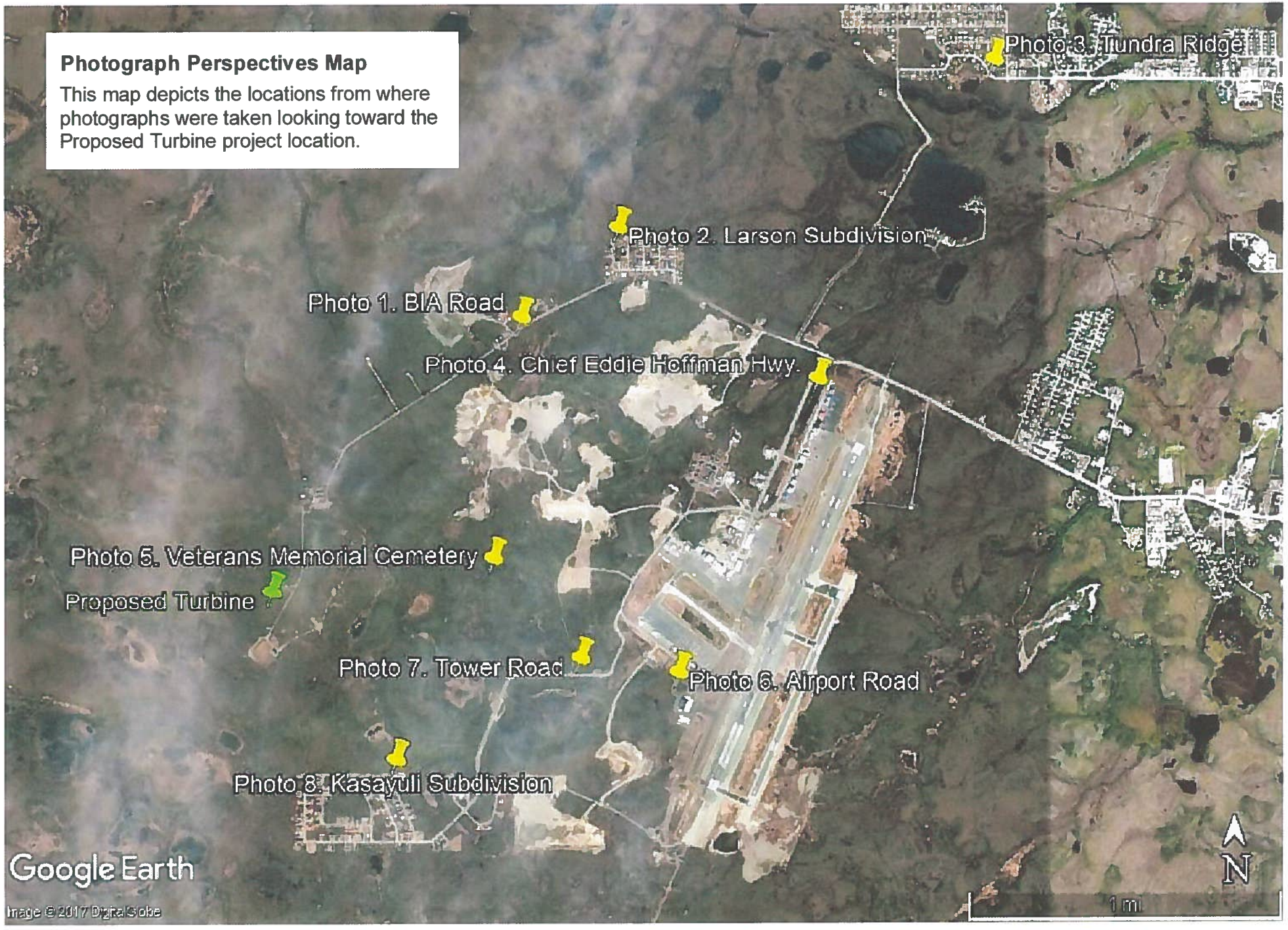
On July 28, 2017, photographs were taken in Bethel from areas where it may be possible to see the proposed turbine. These photos were used to create post-construction simulated images to depict how the proposed wind turbine would appear from various locations in Bethel, including perspectives where the structure may be visible from public rights-of-way and residences.

Pre-Construction Photos and Post-Construction Simulations

The following Photograph Perspectives Map, pre-construction photos (showing current conditions), and post-construction simulations show depictions of the described visual impacts from the following perspectives.

Photo 1. BIA Road
Photo 2. Larson Subdivision
Photo 3. Tundra Ridge Subdivision
Photo 4. Chief Eddie Hoffman Highway
Photo 5. Veterans Memorial Cemetery
Photo 6. Airport Road
Photo 7. Tower Road
Photo 8. Kasayuli Subdivision

The photo from the BIA Road perspective shows the view that would appear from residences near Borrow Pit Road, and the photos from Tundra Ridge and Larson Subdivisions show the view that would appear from residences near H-Marker Lake. *The simulations depict the proposed turbine with the tallest possible proposed tower and brightest possible design color contrast; it is likely that Bethel weather conditions would diminish the contrast between the turbine and the sky.*


Photograph Perspectives Map
This map depicts the locations from where photographs were taken looking toward the Proposed Turbine project location.
Photo 3. Tundra Ridge
Photo 2. Larson Subdivision
Photo 1. BIA Road
Photo 4. Chief Eddie Hoffman Hwy.
Photo 5. Veterans Memorial Cemetery
Proposed Turbine
Photo 7. Tower Road
Photo 6. Airport Road
Photo 8. Kasayuli Subdivision
Google Earth
Image © 2017 DigitalGlobe
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1 mi

Photo 1. From BIA Road (pre-construction)

Photo 1. From BIA Road (simulated post-construction)

LAT: 60°47'35.30"N LONG: 161°51'43.99"W

Photo 2. From Larson Subdivision (pre-construction)

Photo 2. From Larson Subdivision (simulated post-construction)

LAT: 60°47'50.49"N LONG: 161°51'10.40"W

Photo 3. From Tundra Ridge Subdivision (pre-construction)

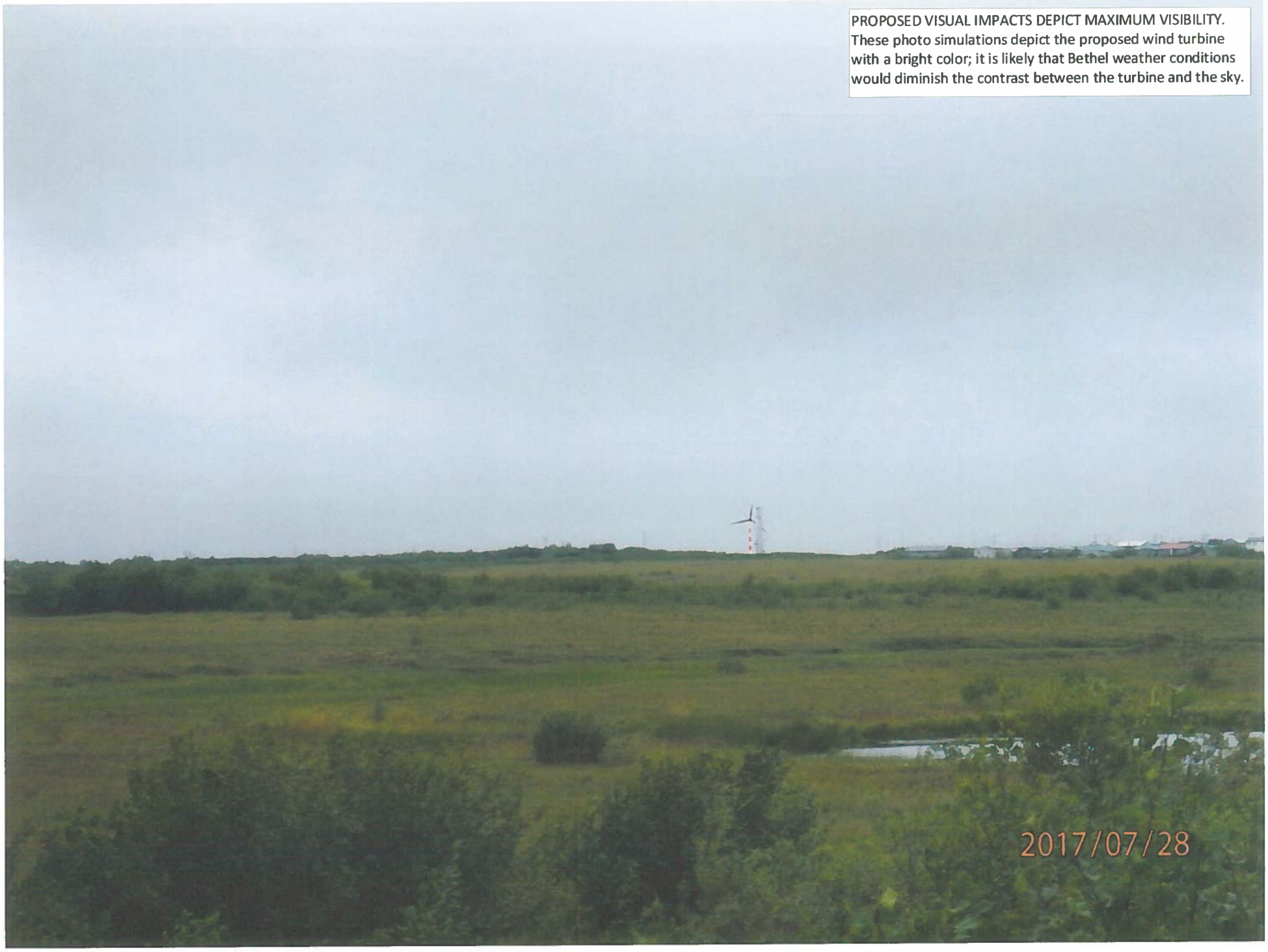

Photo 3. From Tundra Ridge Subdivision (simulated post-construction)

LAT: 60°48'18.96"N LONG: 161°48'59.67"W

Photo 4. From Chief Eddie Hoffman Highway (pre-construction)

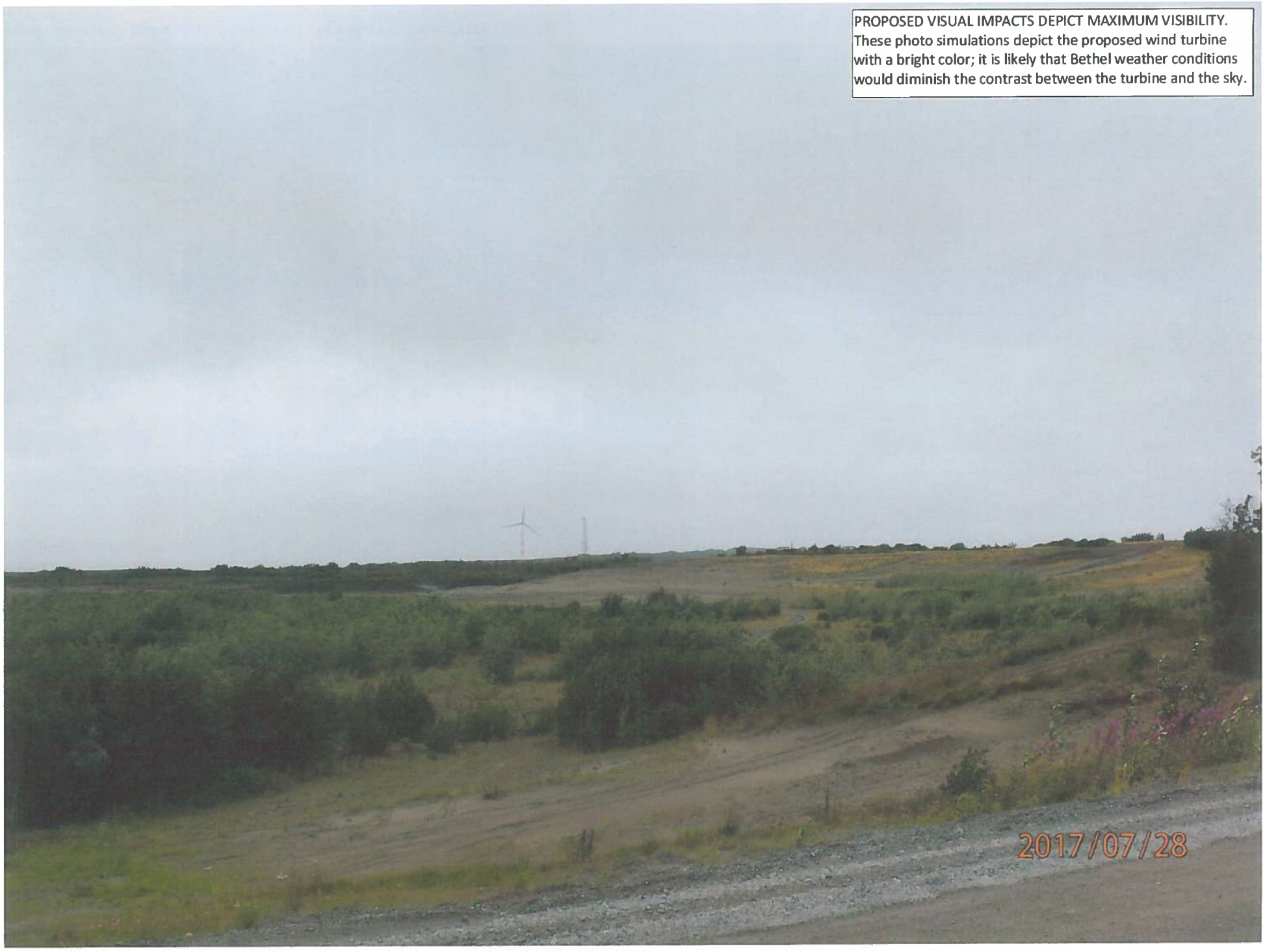

Photo 4. From Chief Eddie Hoffman Highway (simulated post-construction)

LAT: 60°47'24.70"N LONG: 161°50'1.39"W

Photo 5. From Veterans Memorial Cemetery (pre-construction)

Photo 5. From Veterans Memorial Cemetery (simulated post-construction)

LAT: 60°46'54.64"N LONG: 161°51'53.43"W

Photo 6. From Airport Road (pre-construction)

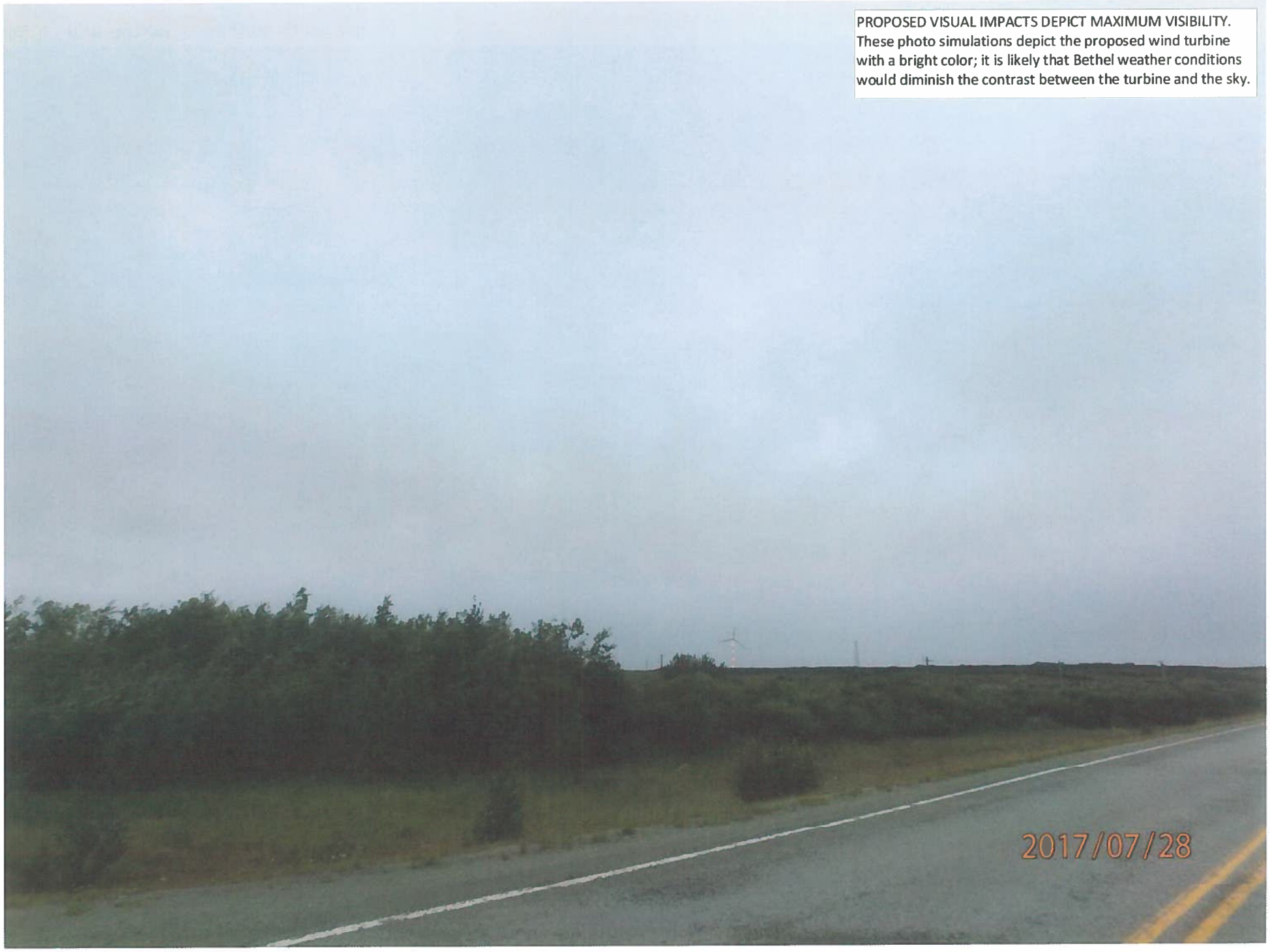

Photo 6. From Airport Road (simulated post-construction)

LAT: 60°46'35.35"N LONG: 161°50'49.60"W

Photo 7. From Tower Road (pre-construction)

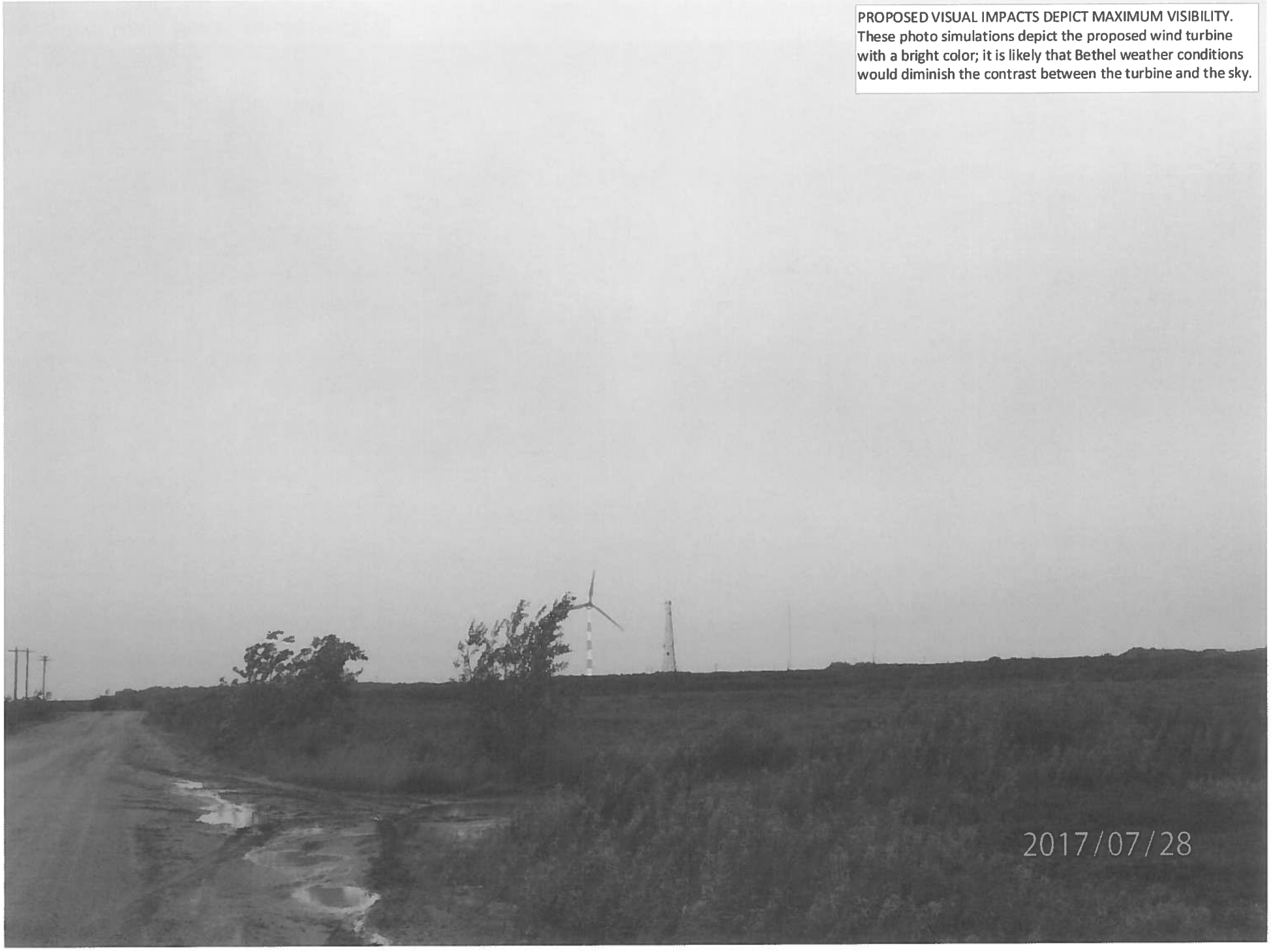

Photo 7. From Tower Road (simulated post-construction)

LAT: 60°46'37.81"N LONG: 161°51'23.25"W

Photo 8. From Kasayuli Subdivision (pre-construction)

PROPOSED VISUAL IMPACTS DEPICT MAXIMUM VISIBILITY. These photo simulations depict the proposed wind turbine with a bright color; it is likely that Bethel weather conditions would diminish the contrast between the turbine and the sky.

Photo 8. From Kasayuli Subdivision (simulated post-construction)

LAT: 60°46'20.79"N LONG: 161°52'26.60"W

3. PROJECT DESCRIPTION/LETTER OF INTENT

ALASKA VILLAGE ELECTRIC COOPERATIVE, INC.

November 1, 2017

Betsy Jumper, Planning Director
City of Bethel
P.O. Box 1388
Bethel, Alaska 99559

RE: Letter of Intent for the Alaska Village Electric Cooperative, Inc. Bethel Wind Project To Comply with the Bethel City Ordinance #15-27 Special Use Permit

Dear Ms. Jumper:

This Letter of Intent is written as a required component of the Bethel Wind Project Special Use Permit Public Hearing Application required by Bethel City Ordinance #15-27 for the placement and construction of a tall tower. With this Letter of Intent, the Alaska Village Electric Cooperative, Inc. (AVEC) describes the Bethel Wind Project's proposed use and impact on surrounding properties; agency authorizations; and Ordinance #15-27 variances as detailed in the City of Bethel Public Hearing Application Forms and Requirements Request for Public Hearing Checklist provided to AVEC on October 3, 2017.

Proposed Use and Impact on Surrounding Properties - Through the AVEC/Bethel Native Corporation Renewable Energy Joint Venture (ABRE) partnership, the Bethel Wind Project includes erecting a wind turbine and constructing a building pad and access road in Bethel.

The *proposed use of the Bethel Wind Project* is to provide approximately 2,100 megawatt hours (MWh) of energy annually to Bethel and the nearby Oscarville and Napakiak through an existing electrical intertie.

The *Bethel Wind Project would result in:*

- Replacement of approximately 140,000 gallons of diesel fuel (for a savings of about $455,000 per year) used annually in Bethel due to the electrical generation of clean, renewable wind power. Over the 20-year life of the project, this means an estimated fuel savings of more than $9.1 million.
- Stabilized energy costs for at least twenty years into the future in three economically disadvantaged, mostly Native Alaskan communities.
- Reduced fossil fuel emissions, resulting in improved air quality, decreased contribution to global climate change, and enhanced environmental protection, including reduced risk of fuel spills, especially for areas important for fishing resources.

In addition to the described energy impacts, the impacts on surrounding properties would be primarily visual, as described in the Visual Impact Assessment. The lighting that would be used to

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comply with Federal Aviation Administration (FAA) standards would not project onto surrounding properties.

Authorizations - The *Bethel Wind Project meets authorizations from the following agencies*:

- The Federal Communications Commission (FCC) through a radio propagation study that confirms no interruption to propagation (Appendix B2).
- The FAA No Hazard to Air Navigation was received by AVEC on September 29, 2017 (Appendix C).
- The U.S. Army Corps of Engineers (USACE) issued permit # POA-2017-403, authorizing placement of fill in wetlands, which received by AVEC on October 17, 2017 (Appendix D1).
    - The USACE issued a Public Notice of Application for Permit for the Bethel Wind Project on August 18, 2017 (Appendix D2).
    - On August 29, 2017, the Alaska State Historic Preservation Officer issued concurrence for No Historic Properties Affected (File No. 3130-IR COE 2017-00963) (Appendix D3).
    - On September 28, 2017, USACE confirmed no written comments were received during the public comment period (Appendix D4).

Variances - There are two components of Ordinance #15-27 that do not apply to this project. As previously discussed with the City of Bethel, including during the Bethel Wind Project meeting on July 28, 2017 (Appendix E), the project will not co-locate antennas, and the turbine base will not be screened from view.

- The project is a wind turbine, which does not safely allow for co-location of antennas.
    - Collocation, as defined in the Bethel Municipal Code as "...[t]he mounting or installation of transmission equipment on an eligible support structure for the purpose of transmitting and/or receiving radio frequency signals for communications purposes," (as required by Ord.15-27, 16.10.020 § 9) cannot be completed safely for wind turbines;
    - Therefore, this project is not able to collocate with other facilities for antenna collocation, and there will be no action to pursue collocation.
- The existing vegetation near the tower base and its location out of town near the end of a dead-end road will not cause a public eyesore. The turbine will not be an attractive nuisance since it is not a climbable structure.

If you have questions or would like additional information, contact Anna Sattler, AVEC Community Liaison, via email at asattler@avec.org or telephone at 907-561-7972.

Sincerely,

Meera Kohler
President and CEO

cc: Peter Williams, City of Bethel;
Patty Burley, City of Bethel
Forest Button, AVEC
Anna Sattler, AVEC

Attachments: Appendix A. Project Description
Appendix B. Airwave Propagation Noninterference
Appendix C. No Hazard to Air Navigation
Appendix D. U.S. Army Corps of Engineers Wetlands Permit and Consultations
Appendix E. Pre-Application Meeting Documentation

Bethel Wind Project
Letter of Intent Appendices

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Appendix A. Project Description

Appendix B. Airwave Propagation Noninterference

Appendix C. No Hazard to Air Navigation

Appendix D. U.S. Army Corps of Enginers Wetlands Permit and Consultations

1. USACE permit #POA-2017-403
2. USACE Public Notice of Application for Permit
3. SHPO No Historic Properties Affected Concurrence
4. USACE No Public Comments Received Confirmation

Appendix E. Pre-Application Meeting Documentation

APPENDIX A.
PROJECT DESCRIPTION

Alaska Village Electric Cooperative, Inc.,
Bethel Wind Project
October 2017 Special Use Permit
Public Hearing Application

PROJECT DESCRIPTION

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Appendices

A1. Bethel Wind Power Project Phase 1 Feasibility Study

A2. Wind Resource Assessment for Bethel

The Alaska Village Electric Cooperative, Inc. (AVEC), through the AVEC/Bethel Native Corporation Renewable Energy Joint Venture (ABRE) partnership, is planning to improve the energy supply in Bethel, Alaska and adjoining communities by erecting a wind turbine within Seward Meridian, Township 8N, Range 72W, Section 15; USGS quadrangle Bethel D-8 SW at approximately latitude 60.78029, longitude -161.88598. CRW Engineering Group, LLC (CRW) is providing engineering support and Solstice Alaska Consulting, Inc. (SolsticeAK) is providing permitting support for the project.

Purpose and Need

The project purpose is to install a wind turbine to provide renewable, clean, and affordable energy for Bethel and nearby communities. A 50-meter (m), 900-kilowatt (kW) wind turbine would be erected and would connect to the existing diesel power generation system, providing

approximately 2,100 megawatt hours (MWh) of energy annually to Bethel and the nearby Oscarville and Napakiak communities through an existing electrical intertie.

The project is needed to reduce fuel use in order to provide Bethel, Oscarville, and Napakiak stable and affordable energy costs. Making a renewable energy source available is needed to provide a more affordable basic need for these communities.

As described in the Letter of Intent, the Bethel Wind Project would result in significant energy savings, replacing diesel fuel; lowering and stabilizing energy costs for Bethel, Oscarville, and Napakiak; increasing environmental conservation benefits from reduced greenhouse gas emissions, improved air quality, and a decreased fuel spill risk.

Project Description

The wind turbine would be constructed on property owned by the Bethel Native Corporation (BNC) in an undeveloped area that is west of Old BIA Road, about 0.3 miles southwest of the Bethel Bureau of Indian Affairs (BIA) Administration Site, and approximately 1.2 miles west of the Bethel Airport. The project components would consist of a wind turbine, building pad, and access road. Equipment would be barged up the Kuskokwim River and transported to the project site.

Wind Turbine

An Emergya Wind Technologies (EWT) DIRECTWIND 50-m wind turbine, with traditional horizontal axis-design, that would produce 900 kW of energy would be installed.

The EWT 50-m turbine is the right tower height for this project; it would meet the project's need for medium to large scale energy production and EWT turbines have performed well in Alaska as described in the TDX Power Bethel Wind Power Project Phase 1 Feasibility Study (Appendix A1).[1] According to the Alaska Energy Authority's Wind Resource Assessment for Bethel, a 50-m turbine subject to Bethel's local air density and wind speed distribution would have a 7.3 meters per second, long-term annual average wind speed, which is a Class 4 wind resource ("good for wind power development") (Appendix A2).[2] The blades turn at the standard speed of 90 to 120 miles per hour.

With typical tower and guy wire installation, the turbine would be about 58-m (190 feet (ft)) tall. As noted in the Visual Impact Assessment, the turbine will be marked and lighted as required by the Federal Aviation Administration (FAA). The turbine will have a white tower with orange stripes, and the blades, connecting at the nacelle, will be black. Red lighting will be attached to the nacelle as stipulated by FAA. The turbine would have a locked door at its base for maintenance personnel to enter. Turbine-generated power would be supplied via an existing above ground distribution line.

---

[1]TDX Power. 2016. Bethel Wind Power Project Phase 1 Feasibility Study, p. 31. July 2016.
[2]Alaska Energy Authority. 2006. Wind Resource Assessment for Bethel, Alaska, p. 12. February 2006.

Building Pad

The turbine would be erected upon a 138-ft by 162-ft (top dimensions) gravel pad. The pad with 2:1 side slopes would extend beyond the base of the turbine in order to allow a maintenance pick-up truck enough room to drive around the turbine. Including the side slopes, the pad footprint would impact a total of 0.51 acres (22,356 square feet [sq. ft.]). A total of 2,208 cubic yards (cy) of locally-available sand fill would be used to construct the building pad.

Access Road

An access road of 26-ft by 285-ft (top dimensions) with 2:1 side slopes would be constructed off the Old BIA Road. Vegetative buffers would protect surrounding wetland areas from runoff. The proposed access road footprint would impact a total of 0.17 acres (7,410 sq ft). The access road would be constructed with 954 cy of locally-available sand.

An established and permanent material site would be utilized for fill material for this project, and no new material site would be developed.

Alternatives Analysis

Alternative turbine locations and turbine heights were considered.

Ridgecrest Drive Alternative

AVEC considered a turbine site in northeast Bethel on Ridgecrest Drive in the vicinity of the public sewage lagoon and landfill at latitude 60.806899, longitude -161.765788. This location was dismissed from further consideration because a bird survey and meetings with U.S. Fish and Wildlife Service determined that year-round bird use of the lagoon and landfill would be an issue[3], and the location was close to schools and residences. Visual impacts to the community in this area would have been substantial.

Bethel BIA Administration Site Alternative

AVEC considered a site northeast of the Bethel BIA Administration Site and northwest of BIA Road at latitude 60.788761, longitude -161.879166. This location was dismissed from further consideration because its impacts on nearby airport flight paths did not meet FAA approval. Visual impacts to the community would have been somewhat substantial at this location.

Old BIA Road Site Alternative

AVEC considered a site west of BIA Road at latitude 60.780436, longitude -161.886944. This location was dismissed from further consideration because it did not meet approval of FAA or KYUK Public Media for Alaska's Yukon-Kuskokwim Delta, Bethel's radio provider.

50-m and 75-m Wind Turbines

A 50-m turbine hub was compared to a 75-m hub for this project's use (using wind speed at the hub heights and comparing monthly mean net power generated, net annual energy production (AEP) and net capacity factor (CF)), and each was reviewed by FAA for the proposed project

[3]ABR, Inc. 2016. Bird Movements at Two Proposed Wind Turbine Sites in Bethel, Alaska. October 2016.

location. *The 50-m turbine hub was approved by FAA for the project location, and the 75-m hub was not permissible and was dismissed from further consideration.*

The 50-m turbine was selected for its potential energy output, which will meet Bethel's energy needs for its investment (Table 1), and because it was approved by FAA.

Table 1. Energy Production: 50-m Wind Turbine Hub

Turbine Hub Height	Wind Speed at Hub Height (m/s)	Net Power (kW)	Net AEP (kWh/year)	Net CF (%)
EWT DW52-900 50-m	7.55	297	2,604,197	33.0

Anticipated Visibility Impacts

See the Visual Impact Assessment for described visibility from public rights-of-way (ROW) and properties within residential areas. As described in the Visual Impact Assessment, the proposed site is almost a mile from any residences, with the closest residence located about 0.6 miles southeast of the site. Additional points of interest where residents may frequent or ROWs exist from where the project would be visible include BIA Road, Noel Polty Boulevard and Airport Road (near the Bethel Airport), the Alaska Army National Guard Readiness Center (about 0.9 miles southeast of the project) and the Veterans Memorial Cemetery (about 1.1 miles east of the project).

The project was sited for least adverse visual impacts by locating the turbine to the southwest area of town at the end of a dead-end road. By co-locating the turbine near existing towers, the project sought to keep with the existing character of the area. Because the GCI/United Utilities, Inc. 64-m (220-ft) tower and KYUK 45-m (148-ft) tower are located in this area, it would fit with the existing skyline features.

As described in the Visual Impact Assessment, a screen would not be constructed around the base of the turbine. It is not applicable to this project and was not pursued because existing willows and alders provide a natural screen between the site and the road, and there would be little opportunity to see the base from the low-traffic, dead-end road near the tower site.

Bethel Wind Project
Project Description Appendices

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Appendix A1. Bethel Wind Power Project Phase 1 Feasibility Study

Appendix A2. Wind Resource Assessment for Bethel

APPENDIX A1.
Bethel Wind Power Project Phase 1 Feasibility Study

AEA Renewable Energy Fund Grant Round IV

Bethel Wind Power Project
Phase 1
Feasibility Study

Date 07/5/2016

Prepared by TDX Power

Jito Coleman, Steve Hoskins, Jan Tierson and Dan Lenel

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a tanadgusix company

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1 Executive Summary

The public electric grid in Bethel is solely powered by diesel generators, as typically found in rural Alaska. The cost of the diesel fuel is high due to high transportation and storage costs. This results in high electric energy costs. However, Bethel has considerable local wind resources that could not only provide a good part of the electric energy, but also provide ample thermal energy to heat residential and public buildings.

In this feasibility study, the following main points were investigated:

- Potential wind turbine sites
- Wind turbines and wind farm size
- Electrical distribution upgrades
- District heat options
- Operational changes
- Fuel savings
- Installed cost
- Economics

The findings of this study are intended to facilitate decisions to include wind power as a source of renewable energy to power the town of Bethel.

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2 General Considerations

This Feasibility Study summarizes the work done to date to analyze the potential for wind power production integration into the Bethel utility system.

2.1 Generic Concerns

First, generic concerns associated with any deployment of wind turbines to the Bethel utility grid were considered:

- Current status of the utility, its infrastructure, loads, thermal loop, and operations
- Potential wind farm sites and distribution limitations
- Power plant controls assessment for wind farm integration

2.2 Wind penetration

To determine the impact of the wind turbines to the utility infrastructure and operational protocols, three levels of wind penetration were defined. The goal was to determine the maximum feasible wind farm size for each level. Alaska Village Electric Cooperative (AVEC) selected the following criteria as the allowable changes that would be allowed within the utility infrastructure (power plant, controls and utility distribution) for each level of wind power being considered, Low, Medium and High.

Three levels of wind penetration are proposed:

1. **Low**
   - No changes except minor protection upgrades.
2. **Medium**
   - Minor changes to power system
   - Add secondary dispatchable loads
   - Moderate distribution transformer upgrades
3. **High**
   - Significant system wide upgrades, no electrical storage
   - No diesel-OFF operation

- Add a fully automated diesel genset for rapid dispatch
- Add secondary dispatchable loads
- Consider distribution system upgrades or expansions

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3 Bethel Utility Evaluation

3.1 Evaluation of electrical loads

The load on the Bethel electrical utility grid ranges from a low of 3 MW to a peak of 7 MW, with seasonal variations typical for a remote Alaskan village. In the recent past there have been minor variations due to weather, but no significant change in overall demand was found. There is some future growth anticipated for the Bethel electrical demand, but that was not predicted, nor incorporated into this study.

Table 1 presents three years of monthly data for Max and Min kW load, as well as the average kW load. Daily profiles in Bethel follow typical load profiles for rural Alaskan villages with low late night and early morning loads, followed by raising loads as the community wakes up, levelized throughout the day and peaking in the evening.

	2010		2013		2014		AVERAGE	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
Jan	3950	7025	3800	6575	3975	6850	3908	6817
Feb	3800	6475	3850	6675	4200	6775	3950	6642
Mar	3990	6525	3925	6525	4050	6656	3988	6569
Apr	3600	6090	3500	6000	3850	6350	3650	6147
May	3200	5550	3400	5950	3400	5950	3333	5817
June	3125	5225	2875	5400	2875	5400	2958	5342
July	3150	5275	3100	5400	2875	5400	3042	5358
Aug	3300	5425	3350	5575	3350	5575	3333	5525
Sept	3300	5725	3420	5660	3420	5660	3380	5682
Oct	3600	5975	3550	5950	3550	5950	3567	5958
Nov	3900	6300	3050	6700	3975	6850	3642	6617
Dec	4050	6800	3825	6675	3825	6675	3900	6717
MIN	3125	5225	2875	5400	2875	5400		
MAX	4050	7025	3925	6700	4200	6850		
AVG	3580	6033	3470	6090	3612	6174		

Table 1: Bethel electrical load profile (kW)

3.2 Thermal Load Evaluation

Table 2 illustrates the Bethel temperature data, which was used to help model the thermal loads in Bethel. While there may be a small amount of thermal load in midsummer, it is insignificant when compared to the other 8 months of the year.

Station: (500754) BETHEL WSO AIRPORT

From Year=1949 To Year=2012

Heating Degree Days for Selected Base Temperature (°F)													
Base	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
65	1841	1599	1615	1196	741	406	303	368	590	1081	1429	1778	12947
60	1686	1457	1460	1046	587	261	164	219	440	926	1279	1623	11147

Table 2: Heating degree days Bethel airport

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Bethel Climate Graph - Alaska Climate Chart

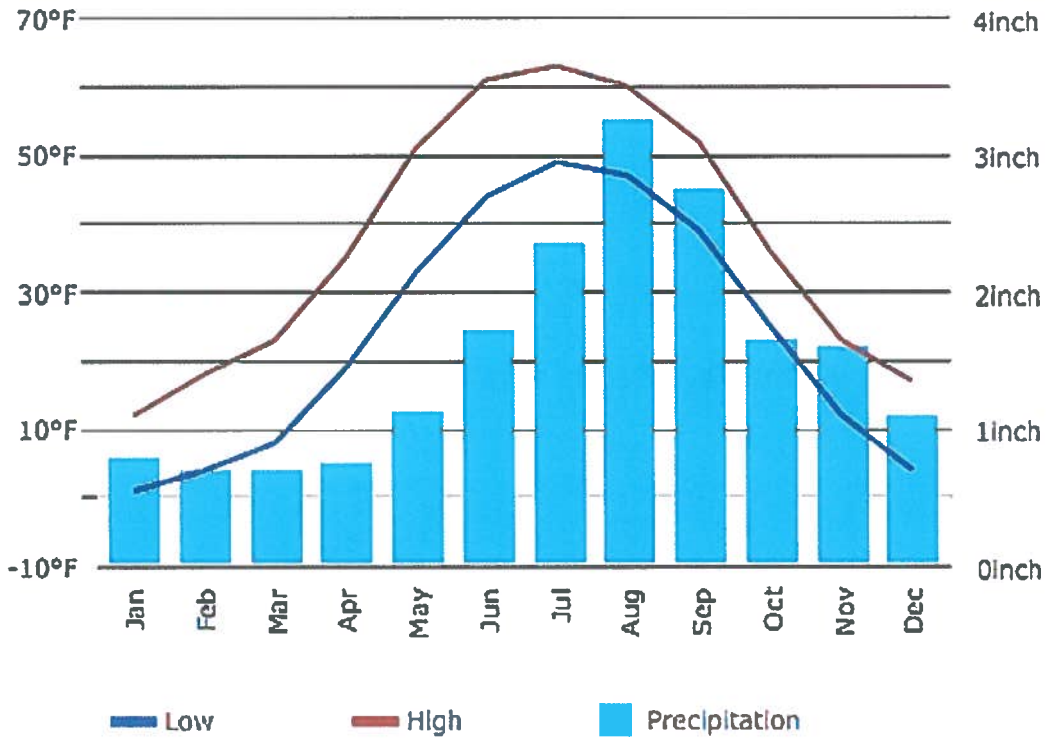

Figure 1: Temperature and precipitation profile Bethel

Historically, the Bethel Utility provided heat to various buildings in central Bethel village from diesel engine jacket water heat collected from the cooling loop. Over time, the system has grown and changed. Some customers have disconnected prior to AVEC ownership. Currently, it is not a significant source of revenue for the utility and little attention has been paid to its performance before AVEC's acquisition.

The current system has no separation of the engine jacket water circuit and the district heating loop for the town. This creates a number of technical-, reliability- and safety issues for the utility. This system was operated by the utility for many years with considerable difficulties.

The main issues are:

- Any leak in the entire system could cause catastrophic engine damage due to the loss of sufficient coolant level/pressure in the engines.
- The contract for the thermal loop operation require a minimum of 175 °F supply temperature for each customer served; this requires the engine jacket water loop to operate at least at 175 °F.
- The engines have a maximum spread of coolant supply/return temperature of about 20 °F to operate properly; the varying return temperature may cause the engines to operate outside the permissible range and may cause thermal stress.
- Integral engine mounted coolant pumps drive the coolant pumping system on the engine side. On the thermal loop supply side, the pumping is done with multiple inline pumps on the feed line that are controlled by the consumers. This causes flow fluctuations in the jacket water, which in turn results in temperature excursions.
- The extended piping runs can absorb oxygen which can cause corrosion and scale deposits in the engine jacket.
- Engines must be run with the proper antifreeze with corrosion inhibitors to prevent internal corrosion in the engine, while the heating loop has less stringent corrosion inhibitor and frost prevention requirements. Maintaining the entire system with engine antifreeze is costly.
- Engine jacket water circuits operate at low pressures, while district heat loops may need to operate at higher pressures to prevent the system from operating below atmospheric pressure at higher elevations and in areas of high velocity.
- Maintaining a large thermal system within the tight pressure requirements of the engine jacket water is very difficult and requires large expansion tanks

Due to the single loop system, the engine operation can't be separated from the district heat operation. For the proper operation of the diesel engines, the engine cooling loops must be able to operate within the manufacturer required limits, independent of the district heat load. Without proper system separation, the district heat loop cannot be optimized and this inherent

limitation does not facilitate expansion of the thermal customer base or optimization of the thermal energy supply.

Revamping the thermal loop could solve many of these problems and provide for a higher reliability for the power system and better performance from the thermal loop. AVEC is in the process of addressing these issues.

3.2.1 District Heat Supply and Use Evaluation

The available heat from the engines using only jacket water heat extraction could recover approximately 30% of the energy in the fuel, slightly less than electrical energy produced at the same time. In 2009, the last year we found Thermal Load sales data, the total billing amount was $863,000 from 34,615 MMBTUs. The price charged to customers was roughly $25/MMBTU ($0.25/thermal unit (10,000BTUs).

During the same year (2009), a total of 39,702 MWh was distributed to the electrical consumers. Based upon 30% heat rejection to jacket water cooling and limiting the heating to only the spring, fall and winter months, the total available heat for the district heat would be about 100,000 MMBTUs. It appears that the utility sold only about 34% of the available heat from the engines.

The current Bethel Utility district heating loop runs through the center of town and near the power plant. Although basically functional, it is in need of maintenance and upgrade.

The heated buildings receive heat from the district heat loop supply side utilizing their own pumps. The cooler return water is routed to the return line back to the powerhouse. The district heat loop is designed as a pressure-less header that has bypasses between supply and return pipes. If customers are not pulling heat from the system, some of the supply flow will return directly to the return side by means of the bypass, so that the circulating loop flow remains approximately constant. This design does not result in optimal heat use from the power plant.

When the return water is too cold to enter the engines directly, it is reheated with a mixing valve from the hot side, before entering the engine return. The power plant operators watch

the pressures and temperatures to keep the system within operational limits. Typical temperature drop in the district heat loop is 4 to 10 °F.

No detailed analysis of the thermal system has been performed, but a number of ideas come to mind to improve the system:

- Separate the diesel coolant from the village thermal loop with an appropriately sized heat exchanger. Leave the radiator, fill tank, engine driven coolant pumps and related hardware on the engine side of the heat exchanger. Install variable speed circulating pumps to the district heat side with appropriately sized expansion tanks and secondary controls. We suggest seeking appropriate engineering companies with expertise in similar applications to design the system properly.

- Review the operation of the district heat loop, including customer usage patterns, thermal pricing, demand development, customer satisfaction and operational costs.

- Review the design and functionality of the district heat loop, including estimating losses, utilization factors, age and wear of existing equipment, maintenance requirements and expansion plans.

Adding wind energy generators to the Bethel electric grid will impact the district heat production as well. Any wind energy generation is opportunistic in nature, depending on the momentary wind speed. When adding wind generators to a large grid, the grid is able to even out the stochastic nature of the generated energy. However, in a small, islanded grid such as in Bethel, the grid may not be able to absorb the generated wind power at times; while at other times, the wind power is insufficient so that most of the electric power has to be generated by the diesel generators. This requires the diesel generators to be controlled so that they can react quickly to changing wind conditions. Additionally, a fast dispatchable electric load is required to absorb excess wind energy in times of high winds and sudden wind gusts. This fast dispatchable electric load is typically controlled by grid frequency and rejects the generated heat to a water loop. The so generated heat will be available to be added to the district heating loop. Additionally, slow dispatchable electric loads such as heat pumps may be installed either at the power house or at the point of use.

As wind power is added to the system, the diesel gensets will generate less electrical energy and therefore produce less thermal energy while the heat produced by the dispatchable electric load

will increase. However, the heat produced by excess wind power will depend on the wind speed, while the heat produced by the diesel generators depends on the electric load. Depending on the wind generation capacity available, the effects may balance out to a certain degree.

As wind penetration increases, a practical limit may be reached where the amount of thermal energy from excess wind will exceed the capacity of the existing district heat loop. At that point, the existing district heat loop may be expanded or alternatively delivering controlled dispatchable heat to other building/homes in Bethel could be accomplished with discrete heaters located at the point of use with wind power routed over the electric transmission lines. Both electric resistive heating units and to a lesser degree heat pumps could be applicable.

3.2.2 Current district heat customers

The following customers are currently connected to the district heat loop:

1. Youth Facility
2. Bethel Jail
3. Calista Apartment Complex
4. PHS Hospital
5. PHS Housing 100, 200, 300, 400, 500, 600, 700
6. K.C.C. Buildings (3 buildings)
7. PATC
8. PATC Annex
9. Fire Station
10. Court House
11. Police Station (old)
12. Library
13. KYUK 2B
14. Braund Bldg

A tentative conclusion that can be drawn from this analysis is that the existing 12,000 MWh/yr of heating energy (40,800 MMBTUs) that is being served by the Power plant heating loop is a small fraction of the total heat load in Bethel that might be developed as dispatchable heat

loads for larger wind farm installations using expansion of the central heating loop and with customer located dispatchable heating units.

Modeling the heat demand in Bethel within the HOMER PRO software used the total heat load from the utility billing documents and heating degree day distribution to predict hourly and monthly heat loads. The hourly/monthly heat loads were ratcheted up when considering larger wind farms that could provide a significantly larger heating capacity. A highest annual heat load used in Homer was 220,000 MMBTUs with a temperature adjusted seasonal profile. The results from the HOMER PRO analysis show that the highest thermal heat load during the winter months is approx. 85 MMBTU/hr, or 2040 MMBTUs/day.

While this will not satisfy the total heat load for the entire community of Bethel, it certainly is larger than any wind farm studied in the report could supply.

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3.3 Electrical Distribution Evaluation

Seven feeders distribute the electrical energy to the Bethel consumers. They are fed from a common 2400V Delta bus in the power plant. Each feeder is protected by a dedicated circuit breaker and can be taken out of service using cut-outs located above the breaker cabinets near the bus. Three of the feeders distribute at 2400V. Each of the remaining four feeders are stepped up to 7200V using three single-phase 500kVA arranged in Delta-Delta configuration. The 7200V feeders are protected by vacuum reclosers located near the step-up transformers.

All seven distribution feeders generally use overhead lines beyond the power plant. The conductors are ACSR and there is a mixture of sizes in use, with 336 kCMIL (Merlin), 4/0, 2/0, and 1/0 AWG conductors being most commonly used. There are a few short sections of underground distribution in the system; underground distribution is generally avoided for all new construction. Sectionalizing switches are installed in a few key locations to allow certain lines to be fed from alternate circuits as needed. There is at least one 2400V:7200V transformer installed to allow a portion of the 7200V circuit to be fed from the neighboring 2400V circuit and vice versa. There are no mid-circuit fuses, reclosers, or any other protection equipment installed on the feeder circuits. No VAR correction capacitors are installed on the feeder circuits. Due to past problems with lightning strikes causing major failure of both arrestors and transformers, there are few if any arrestors installed on the distribution circuits.

There appears to be no effective grounding on the 2400V plant bus and feeder circuits, or on any of the 7200V feeder circuits. All customer distribution transformers on the system are connected line-to-line. The plant bus is typically operated at approx 2500V (about 4.2% high).

Circuit	Voltage	Transformer kVA, %Z	Typ. Min kW (note 1)	Typ. Max kW (note 2)	Dist. Line to Wind Farm Location (note 3)	
#1 – City Subdivision	2400V	---	410kW	1015kW		
#2 – ASHA Housing	2400V	---	390kW	875kW		
#3 – Airport / BIA	7200V	1500kVA, 3.9%Z	305kW	725kW		
#4 – Hospital	2400V	---	300kW	1020kW		
#5 – Downtown Slough	7200V	1500kVA, 3.5%Z	325kW	715kW		
#6 – Tundra Ridge / Ptarmigan	7200V	1500kVA, 5.5%Z	405kW	1350kW	1.5 miles MERLIN, 0.75 miles QUAIL	
#7 – Airport	7200V	1500kVA, 5.13%Z	475kW	1160kW	1.5 miles MERLIN, 2.0 miles QUAIL	

Table 3: MV distribution feeders

Note 1 – From recorded kW data on June 27th 2013, when the 2013 annual minimum total load of 2875kW occurred at 5am.

Note 2 – From recorded kW data on January 14th, 2010, when the 2010 annual maximum total load of 7025kW occurred at 10am.

Note 3 – Distribution cable is ACSR, MERLIN is 336.4kCMIL and QUAIL is 2/0 AWG

Figure 2: Bethel grid map

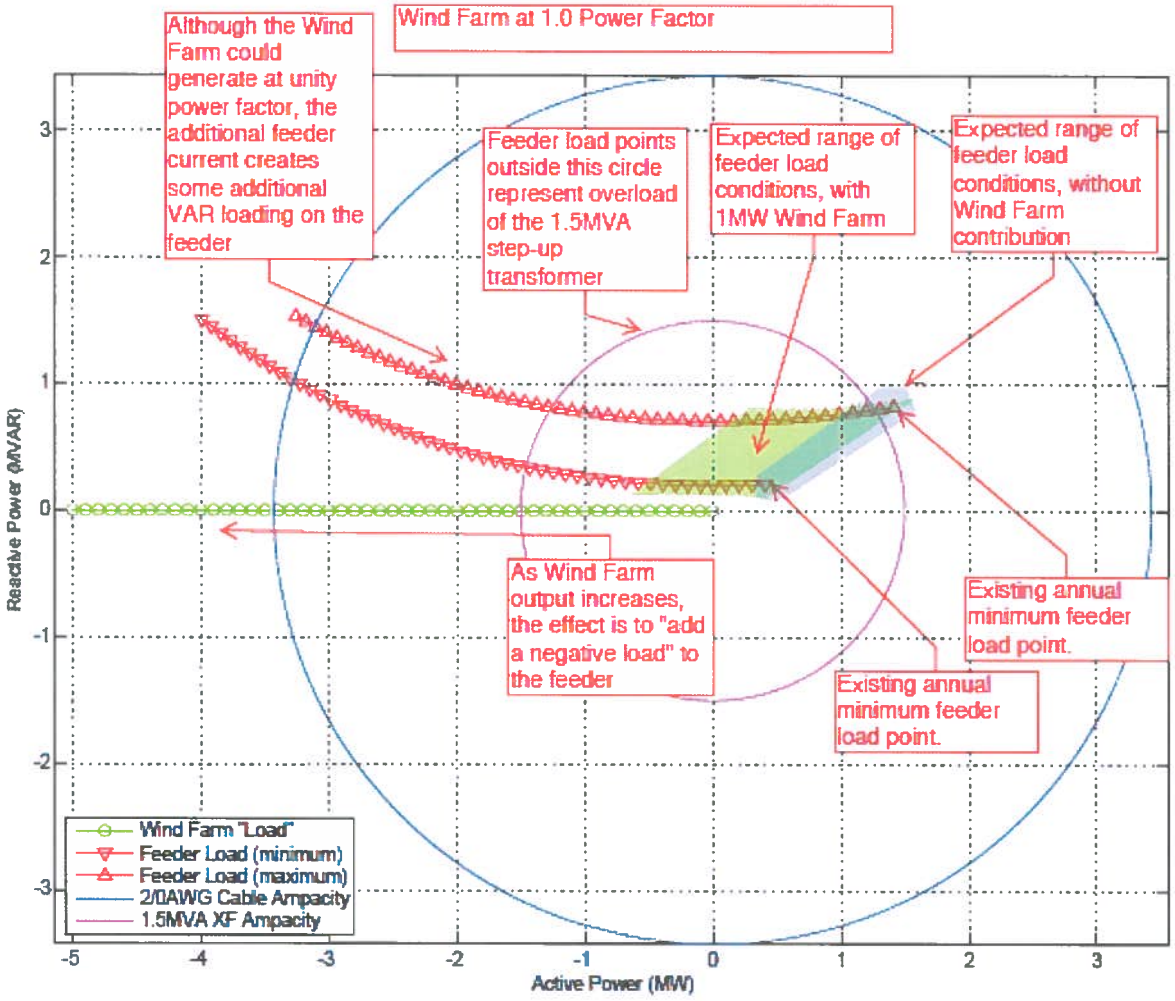


Figure 3: Wind farm feeder operation, for Feeder 6 (City Dump site) Example of results for key feeders

3.3.1 Distribution Limitations

A preliminary analysis of the distribution system shows that currently the transformers, not the power lines, are the limiting factor to increase power in the distribution system, and specifically to the two potential feeders for the wind farm sites. It appears that the transformers would limit the max wind farm size at 3 MW for the city site and 2 MW for the KYUK site. The limitation is imposed by the thermal capacity of the transformers. In actual operation, the electricity produced by the proposed wind farms would be feeding the loads on the distribution before entering the powerhouse. A more detailed analysis of the impact of this scenario on distribution voltage and particularly distribution protection design will be part of future work. Especially if wind farm sizes in the final design would challenge the current distribution capacity.

Figure 3 is an example of the analysis done by TDX aimed at identifying distribution limitations. A more complete analysis was provided to AVEC and AEA earlier in the program.

The Power Plant bus capacity may also pose a sizing limitation on the wind farm. This bus is quite old and will need a more detailed analysis to determine its capacity and upgrade potential as well as reviewing protection issues which will need to be accommodated once the distribution feeder begin back-feeding into the power plant.

3.4 Power plant controls

The plant has five EMD 900 RPM diesel gensets, each rated at 2600kW and one EMD unit rated at 2850kW. The generators are wired in Delta configuration to provide 2400V L-L output. All six gensets are connected to a single common 2400V distribution bus with dedicated switchgear panels (circuit breakers and cut-outs). The gensets and corresponding switchgear and controls are in very good operating condition, especially considering being put into service approx 40 years ago. The genset controls are not automated; the operators manually carry out a series of steps for starting the engines and placing them online and to take them offline and cool down before stopping.

The plant is manned 24 hours a day. The maintenance is diligent and proactive, and the operators maintain extensive data records of engine performance, generation, loads, and fuel consumption.

Diesel generator dispatch is manually controlled by the operators: From initial engine prep to starting and warm up, synchronization and ramping-up load. Typically, the entire start sequence takes around 20 to 30 minutes and is fully ingrained into the operational protocol at the power plant. There gensets have a minimum power output limit of 1.2 MW (~55% of rated). The diesel dispatch strategy currently requires a minimum of two and a maximum of four units to cover the full range of power demand.

A number of operational impacts on the power system will need to be assessed as wind turbines are added to the generation mix. Each evaluation step will also introduce specific new issues. These issues will be identified and addressed in the analysis of each level.

An overriding issue for any wind integration into Bethel will be the capability of the diesel engine governors and voltage regulators to responds to the new demands imposed by the wind systems. The EMDs are equipped with electro-hydraulic governors (Woodward EGB-13B with EGA controllers [disabled]), which have been modified so that they demand significant operator interaction to maintain grid stability. There was sufficient evidence that this will be a limiting factor to the introduction of wind turbines. It is presumed that the diesel engines will not be capable to respond sufficiently to changes in wind turbine output and therefore destabilize the grid. Currently, the engines react very slowly to load changes under normal operating conditions.

AVEC was made aware of this situation by TDX during a site visit. Subsequently AEA funded the installation of new governors (Woodward EGB-13C with 2301 controllers) on all six EMD diesel engines. A program to address this issue was commenced in late 2015 with governors being installed in the third quarter of 2016. AVEC and

TDX will conduct governor performance tests to evaluate and quantify the responsiveness of the new governors as part of the commissioning process.

With the upgraded diesel engine governors we assume that the load/speed and voltage control will be adequate for the introduction of wind power into the Bethel grid. In the second phase of our contract we will be doing simulation analysis, using the measured response from the new governors, to verify system dynamics in wind-diesel mode. In the following, we focus on the dispatch protocol for the engines, as it relates to the level of wind power proposed. The most serious limitation being that the diesel generators will require up to 30 minutes to be started and put on line.

4 Wind Farm Sites

Two locations for a proposed wind farm are prominent in the feasibility assessment.

TDX and AVEC conducted an extensive survey of the land in the Bethel area that might be appropriate for wind farm installations. Past work by AEA located a Met Tower South-west from the airport on the ridge just north of the new subdivision (but AEA document has it miss located nearer the KYUK tower). This ridge which runs from the airport westerly past the White Alice site and the KYUK tower site.

The Town had proposed a wind farm on the land owned by the town just NE of the schools and East of the land fill, however there was only limited site qualification done at that time.

From AVEC point of view the key criteria for location of the potential wind farm were the following:

- Highest elevation sites near town
- Unobstructed wind flow from the predominate wind direction – NE
- Land ownership in supportive hands
- Easy access to existing transmission distribution
- Accessible by existing road
- Lack of environmental issues
- Allowable under current Bethel zoning regulations
- Unencumbered by deed restrictions, covenants or environmental sensitivity issues

TDX and AVEC used these criteria to define our preferred and alternative sites.

Figure 4: Bethel wind farm sites

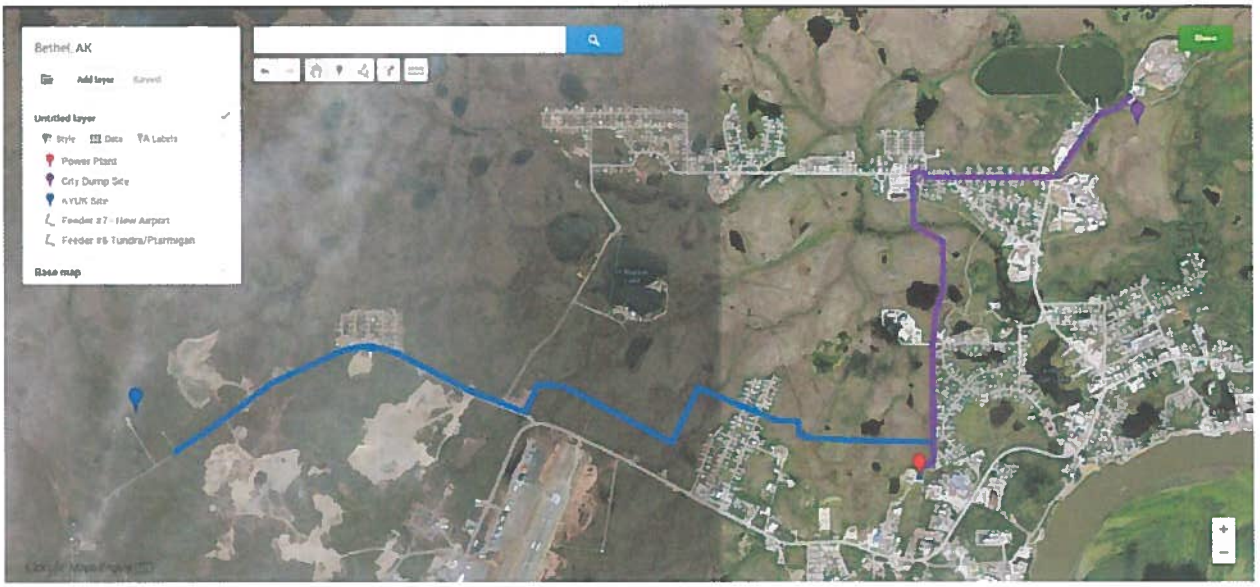


Figure 5: Bethel wind farm sites and closest feeders

4.1 City Dump Site

The first site is near the City Dump on Feeder #6 (shown in Purple) which is owned by the City. This site was originally proposed by the City for possible wind farm development.

Feeder #6 capacity is constrained primarily by the 1.5MVA step-up transformer located at the Plant, and secondarily by the (estimated) ¾ mile of 2/0 ACSR cable. The rating of the transformer limits the Wind Farm capacity to approx. 2.0 MW. Our calculations show that the feeder voltage at the Wind Farm would limit the generated power to about 1.0 MW in the case of minimal feeder load and unity power factor of the wind generators. However, if the Wind Farm can absorb a small amount of reactive power (as most modern wind turbines are equipped with such VAR control capability), the voltage drop can be managed to provide line voltage within +/- 5% along the entire length of the feeder, which would then allow 1.5 to 2.0 MW Wind Farm capacity without overloading the transformer. The operational impact of such a VAR compensation strategy is a modest increase in power loss in the feeder cable due to the higher current, and a somewhat poorer genset power factor.

Possible strategies to upgrade the feeder circuit would include first increasing the rating of the step-up transformer at the Plant to perhaps 3MVA or larger. This would eliminate the primary capacity constraint for the circuit and provide for lower overall voltage drop along the feeder over the range of expected customer load levels. The Wind Farm capacity could then be increased to roughly 2.5 MW without overloading the rest of the existing feeder equipment, at which point the 600A vacuum breaker on the 2400V bus becomes the limiting component. Also, at 2.5 MW or above, the genset power factor would become significantly degraded especially

during peak town load, reducing the efficiency of the generator. The power factor could be increased with the installation of fixed or switched power factor correction capacitors at the plant bus.

At times of minimum town load and high wind resource, the generated power of a 2.5 MW Wind Farm would exceed the demand and require active wind generation curtailing and/or activation of fast dispatchable loads ("load dumping").

Since the current diesel gensets are limited to a minimal load of 1.2 MW, a smaller genset would need to be installed in the plant to allow lower minimum load operation during times of high wind speeds.

Operation of a Wind Farm larger than approx 2.5 MW on this feeder would require (at a minimum) upgrading the transformers, plant feeder switchgear and replacing the 2/0AWG ACSR with larger conductors.

4.2 Radio Tower Site

The second site is west of the airport on the KYUK radio tower lot and connected to Feeder #7 (shown in Blue). The KYUK lot size is probably not big enough to allow a sizeable wind farm development, but the land north and west of this site is owned by the Bethel Native Corporation, which has expressed some interest in wind farm development. Adjacent to the KYUK lot is also the abandoned BIA complex, just to the north and east of the site. Both sites are accessible via dirt roads maintained by the city.

Feeder #7 constraints are similar to that of Feeder #6. The primary constraint is the 1.5MVA step-up transformer, but also the much longer run of 2/0 ACSR cable. This means that the Wind Farm must absorb additional reactive power to keep the line voltage within reasonable tolerances. The additional reactive power flow causes even greater power loss in the feeder cable and worse genset power factor. A Wind Farm capacity of roughly 1.5 MW would be the maximum feasible level assuming the majority of the feeder load is near the Wind Farm. If the actual load distribution along the feeder is substantially different (i.e. if much of the feeder load is located near the Plant) then the beneficial effects of feeder load cancellation will not occur. In this case, the larger voltage drop on the 2/0AWG ACSR portion of the feeder circuit further decreases the viable maximum Wind Farm capacity.

The strategies for upgrading the feeder circuit are similar to those outlined for Feeder #6 above. Increasing the MVA rating of the step-up transformer at the Plant would be the first step, followed by replacing at least some if not all of the 2/0 ACSR cable with larger conductors when looking at Wind Farm ratings of 1.5MW and up. The replacement of the 600A vacuum breaker at the plant would be the recommended third step to achieve a substantial up-rating of the Feeder #7 circuit. Similar to Feeder #6, the wind farm operation and additional line length results in a lower generator power factor. Installing power factor correction capacitors should be considered.

The option of changing the feeder voltage from 7200V to 12.47kV or 13.8kV is unlikely to be feasible due to substantial cost of replacing not only the plant step-up transformer, but also all customer service transformers along the feeder.

Regardless of which feeder circuit will be used to connect the proposed Wind Farm, the exact geographical distribution of loads along the length of the feeder should be brought into the analysis during the next phase of the design.

5 Homer Pro Modeling

5.1 Overview

Homer Pro was selected as the hybrid wind system modeling analysis. Input data for the model was based upon the measured electrical loads, the 2006 AEA Wind Resource Assessment report, NOAA thermal data, assessment of the utility's district heating loop performance and performance characteristics for the diesel gensets and wind turbines.

5.2 Data Sources

5.2.1 Electrical data

The measured Bethel electrical load data recorded by the utility was used as input to Homer Pro.

5.2.2 Thermal data

The thermal demand for the district heat used in the Homer Pro modeling was significantly larger than the current demand, which seems reasonable given the size of the town. The modeled thermal loads were seasonally adjusted based upon historical site temperature and heating degree day data.

5.2.3 Wind Data

We used the Met data from 2006 AEA Wind Resource Assessment to characterize the wind resource in Homer Pro:

- Met Tower height – 50 meter
- Annual Average Wind Speed – 7.32 m/s
- Average wind shear – 30 to 50 meters - 0.19
- Turbulence Intensity for power winds – 6%

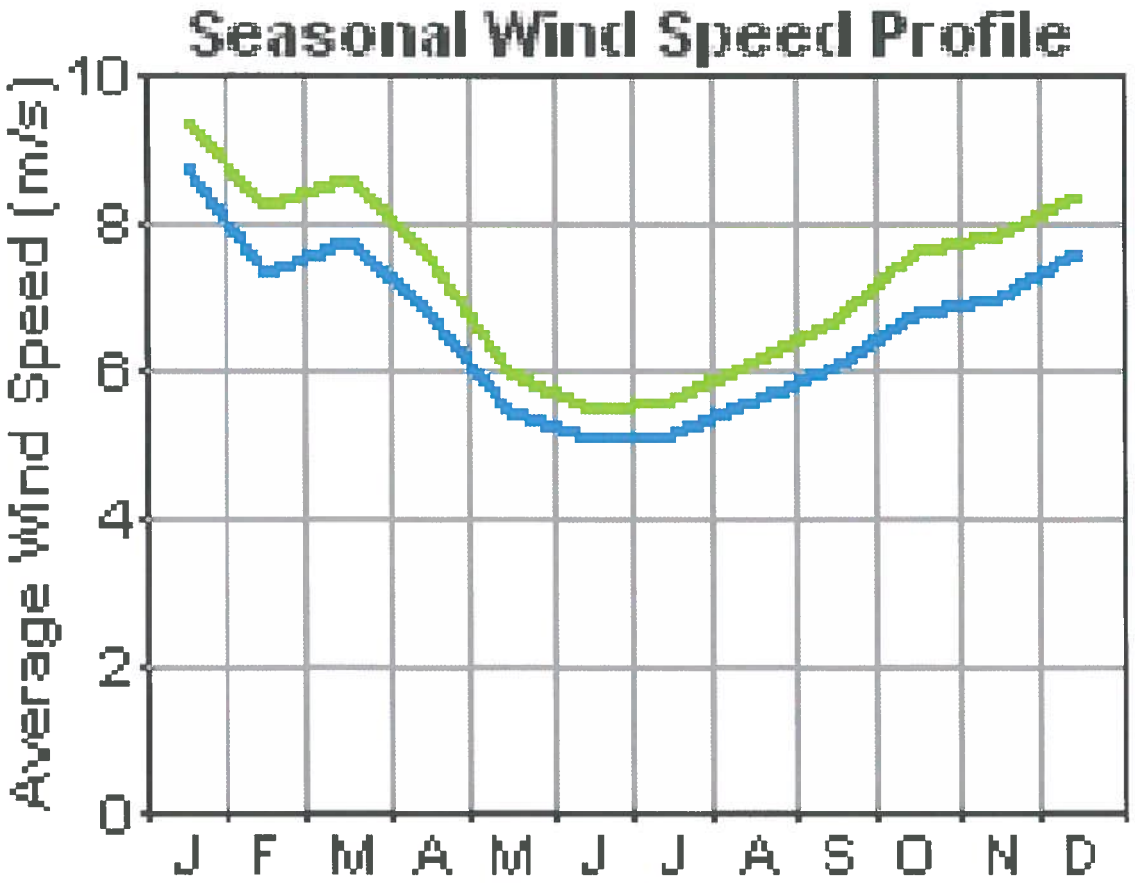


Figure 6: Bethel wind speed profile

5.3 Wind Turbine Performance Modeling

Homer Pro offers improvements to the original Homer software by addressing separately the performance impacts on the wind turbines from operational-, environmental and design factors. Homer Pro adjusts the turbine power curve accordingly. For the Bethel analysis the following adjustments were made.

5.3.1 Wind Turbine Performance Adjustments

5.3.1.1 Wind Turbine Losses:

Degrading wind energy output based upon estimates for typical wind turbine losses. A list of these losses are shown in Figure 2. Homer Pro reduces the power output of the wind turbine to account for these losses. This is a reasonable assumption for cumulative energy capture, since for practical purposes, these losses occur continuously. The following wind turbine losses were considered:

Wind Turbine Losses	
Tuning	2%
Dirt build-up on blades	2%
Turbine Array	0%
Electrical Transmission	6%
Wind Turbulence	2%
Misc	4%
Total Losses	16%

Table 4: Wind turbine losses

5.3.2 Wind Farm Operational Losses:

5.3.2.1 Turbine Availability:

The wind farm output is limited by lack of turbine availability and potential curtailment requirements from the utility. Turbine availability tends to be lower in rural Alaska, since repair time is increased by remote locations, lack of infrastructure and maintenance resources. Bethel, which has direct regular daily flights from/to Anchorage, should fare better than most rural villages. AEA experience in rural villages has shown a 10%/year down-time. Bethel would be more akin to Kodiak, Kotzebue or Nome, where turbine availability has been significantly higher than 90%.
With current modern turbines, stronger support, trained maintenance organizations and turbine models with proven Alaskan track record and sizeable Alaskan fleets, there are strong arguments for a higher availability estimate. For this analysis, 98% availability was assumed.

5.3.2.2 Utility Curtailment:

The utility may have needs to curtail the turbine output during utility maintenance events or other situations which might arise. For this analysis we used 2%/year (175 hours/year) for wind farm curtailment due to utility maintenance requirements. This value is consistent with AEA field experience for similar utilities. Depending on the size and complexity of the selected wind farm and its supporting controls and secondary equipment, this value should be reassessed during the Conceptual Design phase. Turbine blade icing will be discussed in Section 5.5

5.3.2.3 Overall operational losses

Based on the above, the overall combined Wind Farm Operational losses equal 20%. This again is consistent with AEA experience for larger wind farms, but significantly higher than can be expected for a wind farm in the lower 48.

HomerPro adjusts the manufacturer's power curve with a by 20% decrease for the modeling.

Turbine performance Adjustments:	
Wind turbine losses	16%
Lack of turbine availability	2%
Utility Curtailment	2%
Icing	0%
Total	20%

Table 5: Wind turbine performance adjustments

5.4 Turbine Options

TDX and AVEC are considering two turbine models for the Bethel project:

- EWT 900-54 on a 75 meter tower
- GE 2.4-107 on a 80 meter tower

Anemometer data at 50 meters indicates an annual average wind speed of 7.32 m/s with an average wind shear factor of 0.19 and very low influence from surface roughness. Therefore, predicted hub height annual wind speeds for 75 or 80 meter towers would be around 7.83 m/s. This would require a Class II wind turbine; both of the chosen models meet that criteria.

The EWT turbine might be the better choice for small to medium sized projects, based on the positive experience with this turbine in Alaska.

The larger GE turbines are a better choice for medium to large scale projects.

5.4.1 Predicted annual energy production

To predict the annual wind energy production, we used the following data:

- 7.32 m/s at 50 meters
- Surface Roughness 0.03
- 20% Reduction in Power Curve for identified losses

Wind turbine model	MWh/yr	Capacity factor
EWT 900-54 on a 75 meter tower	2,500	31.71%
GE 2.4-107 on a 80 meter tower	7,954	37.84%

Figure 5: Wind Turbine Annual Energy Predictions

The energy production and losses modeled appear to be appropriate for well run wind systems.

The total operational losses are below the range of AEA's past experience for rural Alaskan community wind systems, but reasonably when compared to larger Alaska wind farms and experience with EWT and GE turbines in Alaska. A capacity factor in the range of 25 to 28% represents an Alaskan fleet wide average for smaller remote village systems. There is a number of factors that contribute to the capacity factor, which will need further study, but at this time it appears that the larger project with new turbines could be justified based on the predicted performance.

Further adjustments to overall turbine output for icing will need to be included but will be addressed outside of the Homer analysis, since icing impacts varies per month; Homer cannot make this adjustment on a monthly basis. Additionally, the data on the amount of icing is unclear and needs further evaluation. However, we considered icing impact on financial and economic evaluations.

5.5 System Constraints and Controls

Within the Homer model there are a number of factors that can be changed to adjust the model for operational conditions. To better simulate the Bethel power plant, two gensets were forced on continuously, no matter what the wind output or total load was. This limited the system from going to a single genset or wind-only operation, when the high wind penetration configurations were analyzed.

Genset dispatch was based on spinning reserves for a 10% load variation and a 25% wind variation within each time step. Spinning reserves can only be provided by the diesel engines in this configuration. When considering high wind penetration systems, these reserve margins should be reviewed with the specific design in mind. For the purposes of this Feasibility Study, the 10% and 25% reserves were used.

Since we assumed a much higher than the current thermal demand for the district heat, we were less restricted in our evaluation of the thermal performance of the proposed wind farms. We modeled both modes of heat distribution, the expansion of the thermal loop as well as thermal energy to be delivered over the electrical distribution system. We found that the modeled heat production was significantly higher than the demand for high wind penetration scenario.

5.6 Icing

Bethel can be subject to icing conditions during the winter months. Anemometer data from the 2006 Wind Resource Assessment indicated icing could be a concern. During the 3 mid winter months of the reporting period, the anemometer readings were affected 30% of the time due to icing. Icing conditions were noted during eight months of that year.

In the 2006 Wind Resource Assessment, icing conditions were detected as follows:

"Anomalies in the data can suggest when the sensors were not recording accurately due to icing events. Since wind vanes tend to freeze before the anemometers, icing events are typically identified whenever the 10-minute standard deviation of the wind vane is zero (the wind vane is not moving) and the temperature is at or below freezing. Some additional time periods before and after the icing event were removed to account for the slow build up and shedding of ice on the sensors."

Figure 3 presents the summary from the Wind Resource Assessment Report for Bethel, dated 2006

2015	Data recovery rate	Loss due to Icing
January	100%	11%
February	100%	34%
March	100%	8%
April	100%	6%
May	100%	2%
June	100%	0%
July	100%	0%
August	100%	0%
September	100%	0%
October	100%	16%
November	100%	31%
December	100%	54%
Annual Average	100%	13%

Table 6: Icing data for met tower anemometers

A Wind Resource Assessment in 2010-2011 in the nearby village of Napakiak, about 20 miles south west of Bethel, showed only minor icing. Below an excerpt from the report:

"Icing Event:

The Napakiak met tower site is at an elevation of 17 meters, too low for destructive (hard) rime ice to form, although soft rime icing (hoarfrost) occurs occasionally. Freezing rain, sleet, and other similar cold climate events

occur more often, which can compromise anemometer and wind vane data. These are not likely however to seriously impede wind turbine operations."

AVEC initiated a Wind Resource Assessment plan in Bethel for the preferred wind farm locations. The data collection includes icing information and was initiated in Oct 2015. Note: early data from the new anemometers have shown little icing in the fall and winter of 2015 – 2016

Converting of anemometer icing data into actual wind power loss is more of an art than science at this time. The nature of the ice build-up on wind turbine blades and the associated effect on wind turbine output varies significantly. A recent Paper by Rich Stromberg, AEA, entitled "A study of icing on anemometers and the resulting impact on wind turbine operation, predictive modeling in cold-weather environments", provides insight on the correlation of anemometer data to actual turbine performance.

2006	Average Power kW	Days -	Predicted production kWh	Icing recorded % time	Actual production kWh
Jan	410	31	305,040	11%	271,486
Feb	355	28	238,560	34%	157,450
Mar	380	31	282,720	8%	260,102
Apr	309	30	222,480	6%	209,131
May	195	31	145,080	2%	142,178
June	160	30	115,200	0%	115,200
July	165	31	122,760	0%	122,760
Aug	210	31	156,240	0%	156,240
Setp	245	30	176,400	0%	176,400
Oct	310	31	230,640	16%	193,738
Nov	330	30	237,600	31%	163,944
Dec	360	31	267,840	54%	123,206
Annual Totals			**2,500,560**	**13.5%**	**2,091,835**
Impact of Icing					**-16.3%**

Table 7: Monthly icing evaluation

The month-by-month analysis yields an even larger annual performance impact due to icing, since the windiest months of the year also coincide with the highest probability of icing.

Additional analysis of the icing conditions at Bethel is an important aspect of future work, since the studies indicate icing to be a major concern on the overall turbine production and system economics.
Once critical ice build-up on the turbine blades is reached, the turbines need to be shut down.
Since the Homer model doesn't allow for seasonal turbine performance adjustments, production loss due to icing was left out for the Homer Pro modeling exercise. However, a 16% annual performance reduction was used in calculating the project economics and financials.

6 Wind Farm with Low Level Wind Penetration:

6.1 Requirements for Wind Farm Sizing

Boundary conditions for low wind penetration wind farm sizing:

- No changes to the power plant, controls strategy or distribution.
- No operational protocol changes to diesel dispatch plan

The largest possible wind farm size that adheres to the above constraints, will be governed by the variable output of the wind plant and its impact on the diesel generator dispatch. The diesel generators are required to operate within their desired output range (1.2 to 2.2 MW). For Low Level wind penetration, the wind farm operation must not affect diesel generator dispatch.

To carry the Bethel loads, the utility operates between 2 and 4 EMDs in parallel to cover the electricity demand and provide reserve capacity for load variations. Figure 7 shows the typical dispatch decisions as load varies. Superimposed is the impact of a 1 MW wind farm. The stair steps are the max and min output of 2, 3 and 4 EMD running in parallel.

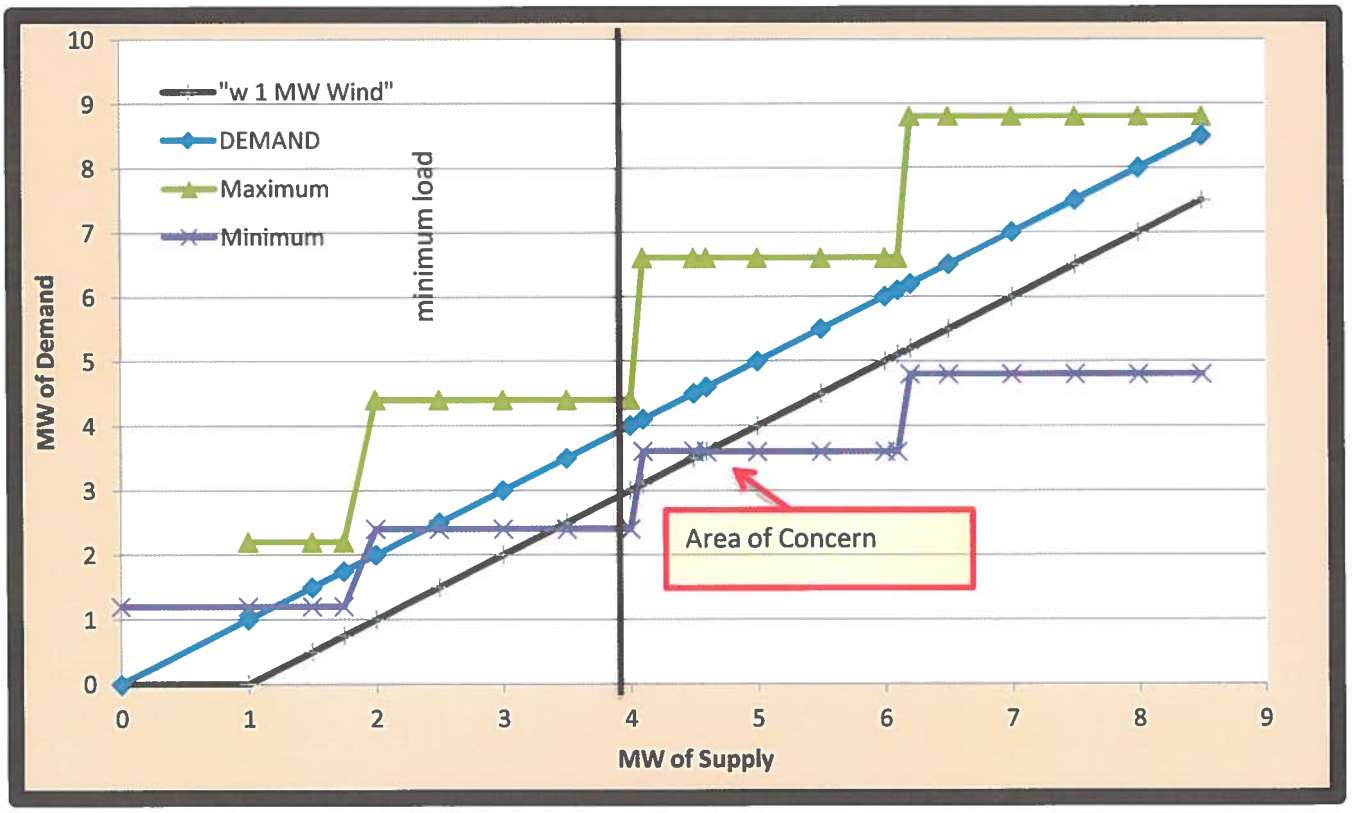


Figure 7: One MW wind farm impact on diesel generator dispatch

The identified "Area of Concern" for this 1 MW example only exists when total demand is between 4 and 4.5 MW and a genset dispatch decision is imminent. In this case the dispatch decision is going between 2 and 3 engines to cover the load, or going from 3 to 2 engines to avoid under-loading the diesels.

At about 4 MW of total load, and when the load is predicted to grow, the operators must decide to start a third engine so as not to overload the two engines when the load increases. Each of the EMD engines are rated for 2.2 MW continuous duty.

With a 1 MW wind turbine on line, the actual load on the diesel will change with wind turbine output, which is represented in the tan colored trapezoid. The red triangle represents the possibility of under-loading the three EMDs. At the maximum under-loading condition each of the three EMD would be operating at 1 MW or 45% rated load.

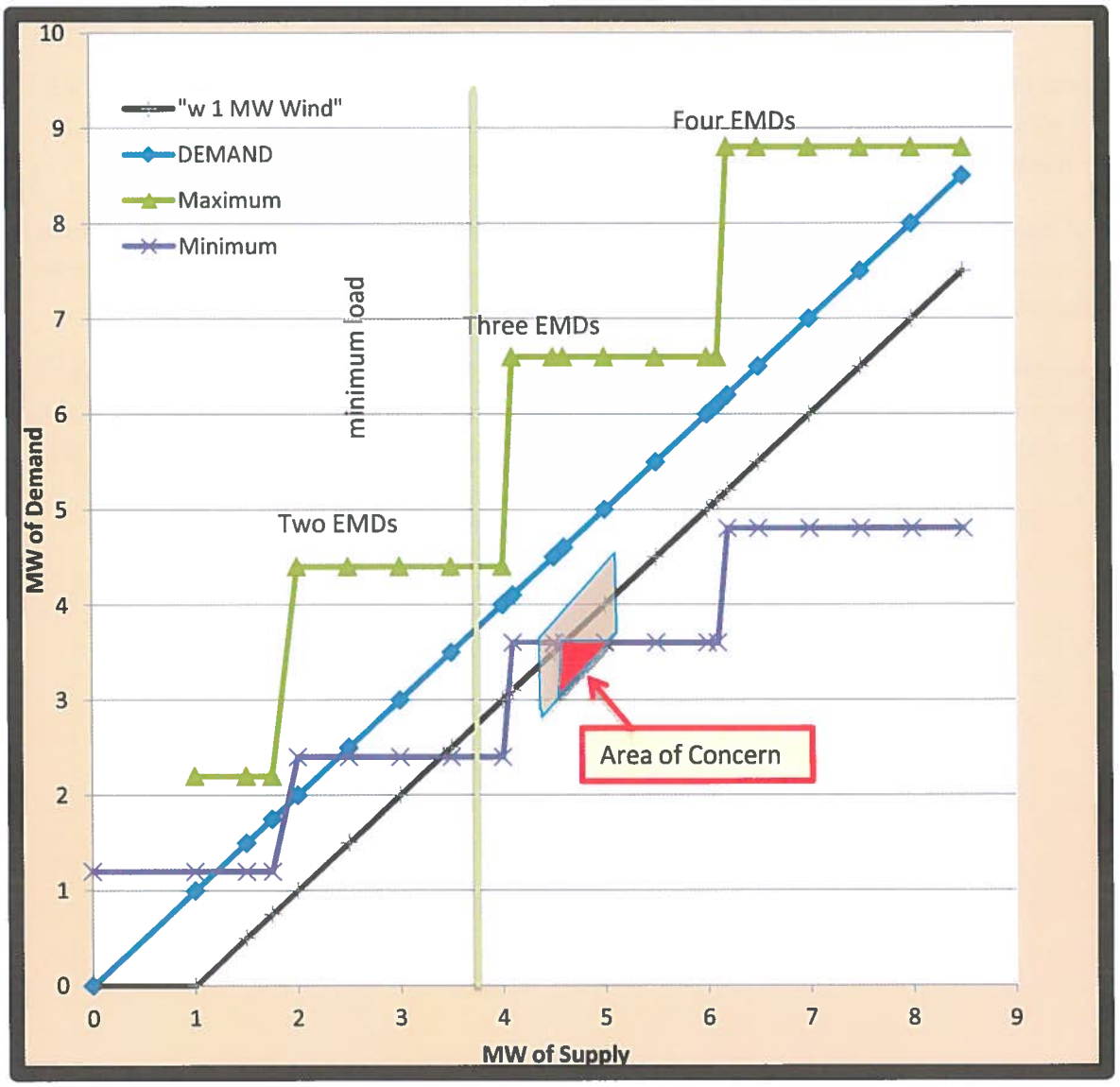


Figure 8: One MW diesel generator dispatch, "area of concern"

The operator is faced with a new Operational Protocol, which violates the rules stated above for the low wind penetration system. However, the potential operational issues from a short duration under-loading of the EMDs would certainly not be destructive to the system but would fall outside the current operational protocol for the engines.

When looking at these curves, the 1 MW lines represent the wind turbines rated output which occurs at high winds, typically above 28 mph. The winds in Bethel will reach turbine rated power roughly 10% of the year. The Bethel load currently is below 4.5 MW about 20% of the time, mostly at night, so this concern is real and it could

happen almost any night of the year. Therefore, the condition will be experienced and must be addressed with some form of automated controls if the wind farm will have a capacity greater than 500 kW.

The best available control option is to select a wind turbine with power control option. In our case both the GE and EWT have a power control functionality that will automatically limit wind turbine output in real time in response to a control signal.

Since this event will occur so infrequently, there is only a relatively small amount of wind energy that will be lost due to curtailment. This type of curtailment system is simple to deploy and reliable. Using a controllable secondary load, which would provide the same functionality, would be significantly more expensive and would not be economically justified by the energy captured.

6.2 Control Options

- Pick a wind turbine model with controllable adjustable power set point. This would allow a controller to automatically dial back the wind turbine output to avoid under-loading the diesel engines. This type of control would allow for a much higher rated wind farm, whose practical limits might be the financial metrics associated with lack of revenue due to excessive curtailment of wind power.

- The EWT and the GE model turbine both allow for controllable power adjustment while the turbines are operational.

- Older Vestas turbines have been effectively retrofitted with this functionality using after-market controllers.

Larger wind farm size of 2 MW will increase the occurrence of "Areas of Concern" where the diesels may experience over-load/under-load scenarios, unless power control is implemented. With power controls available to address these "Areas of Concern", wind farms of up to 2 MW size may be considered.

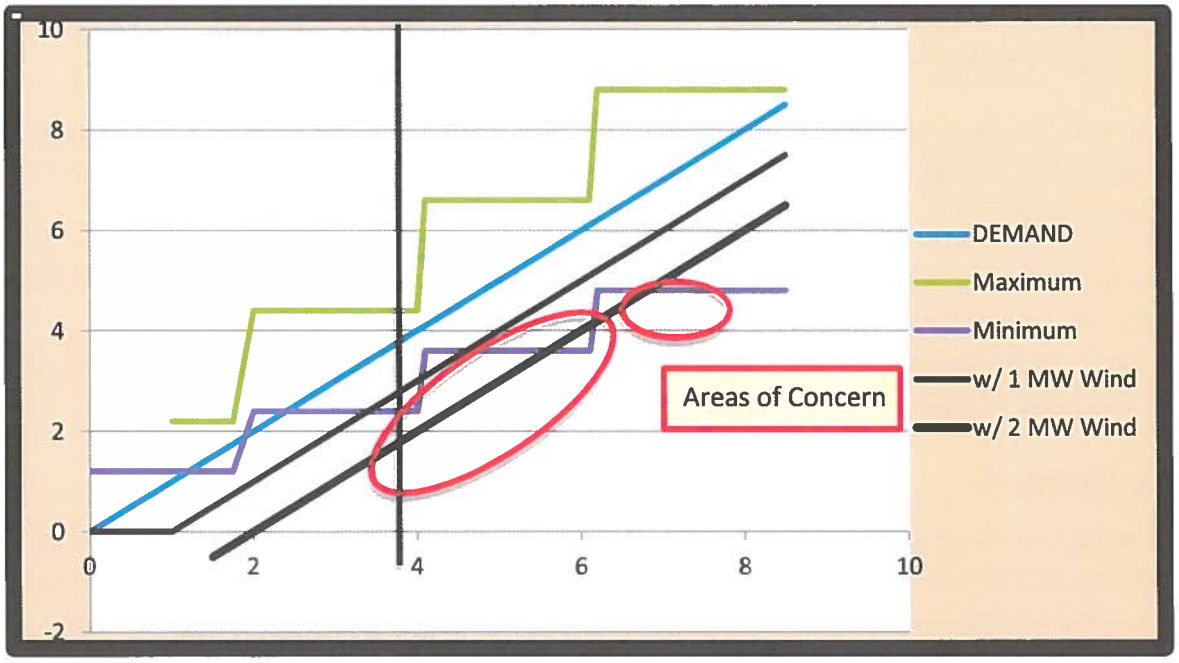


Figure 9: Two MW wind farm impact of Diesel Dispatch Decisions

6.3 Diesel Generator Dispatch

A serious limitation in Bethel is the length of time it takes to start and synchronize an EMD diesel generator to the Bethel grid. The current EMD starting sequence takes about 20 to 30 minutes to execute. This will not necessarily change our conclusion about the ability to connect a larger wind farm, but it will certainly increase the amount of curtailed wind energy due to the prolonged use of wind turbine power curtailment.

Using Homer Pro and adjusting the Wind Reserve from the nominal amount of 20% to 100%, forces the model to make dispatch decisions disregarding the amount of wind energy available. In this way, the model is forced to make the appropriate diesel dispatch strategy based solely on load. Homer Pro calculates the amount of curtailed wind energy under both cases. With a wind farm of two EWT 900, only 177 MWh/yr of energy are curtailed out of the total production of 4,944 MWh/yr, or 3.5% of total wind farm output.

6.4 Wind Turbine with Power Control Option

From the dispatch analysis summarized above, it appears that a 2 MW wind farm utilizing only power limiting controls on the wind turbines is feasible. Wind curtailment would occur most when the winds are high and the load is low.

Instead of modeling limited wind turbine power output, we introduced a secondary load ("dump load") in the Homer model to analyze this situation. We configured the Homer model with two diesel engines forced to run continuously to model a solid diesel base load, and then looked at the amount of "excess" wind energy that

would be absorbed by the secondary load. This should provide a reasonable assessment of the amount of energy that would need to be curtailed, since the effect of both control techniques is similar.

The following graph summarizes the total wind energy production and the curtailed energy due to wind turbine power control implementation. The modeling shown is for the EWT 54 900 turbine with 0 to 3 units deployed (0 to 2.7 MW)

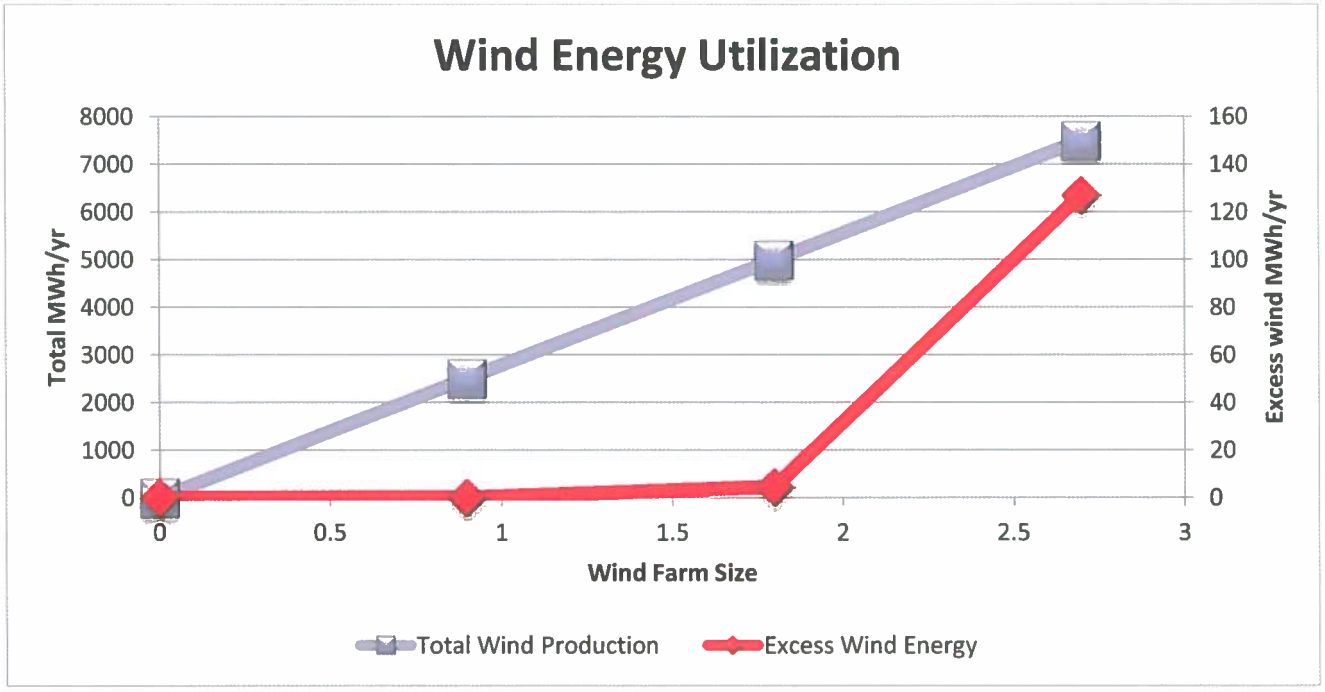


Figure 10: Wind energy utilization

The small amount of wind energy curtailed is insignificant compared to the total wind energy generated. However, as the wind farm size increases, the percentage of energy that needs to be curtailed grows. Figure 10 illustrates this point.

With a wind farm size of 2.7 MW, the total curtailed wind energy is still under 2% of total production. The seasonal wind power curtailment is shown in Figure 11.

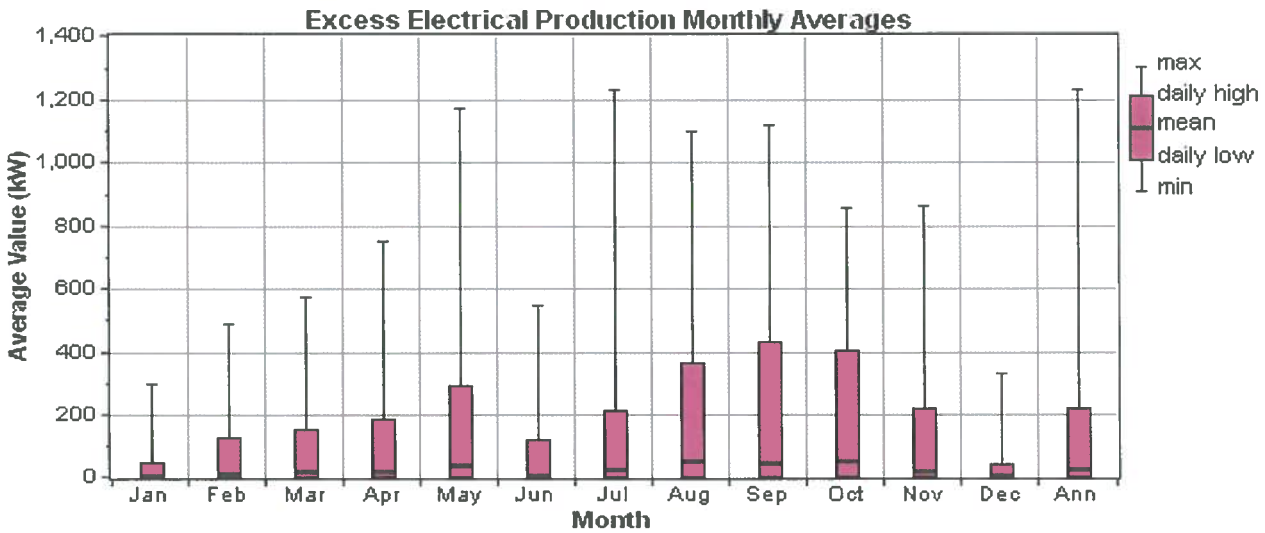


Figure 11: Excess Power from 2.7 MW Wind Farm

The mean level of curtailment with the 2.7 MW wind farm is about 25 kW with peaks of 1.2 MW. Curtailment occurs in every month and possibly daily depending on the wind and load conditions. Wind power control options will also be addressed in the Conceptual Design Report.

The Duration curve (frequency distribution) shown in Figure 12 further illustrates the amount of time the curtailment would occur annually.

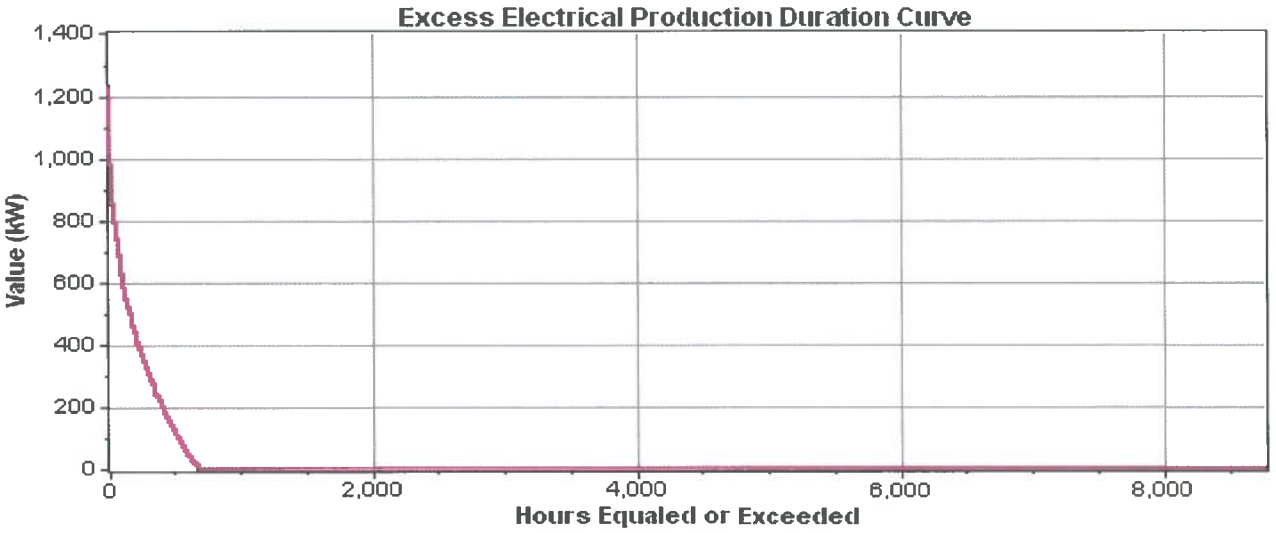


Figure 12: Excess Power for 2.7 MW Wind Farm

6.5 Performance Summary

Note: The effects of icing are not included in the performance summary below.

The primary value of a low penetration wind farm is the displacement of diesel fuel with no value for excess wind energy. As shown above, the excess wind energy is usually not worth capturing.
At the upper limit of the low penetration spectrum, about 2 MW, the wind can carry about 14% of the total load and reduces the run time of the diesel fleet from 24,000 hours to 22,000 hours per year.
The annual fuel savings (without accounting for icing) is proportional at about 180,000 gallons per MW of wind farm. There will be a small reduction in available heat from the diesel generators due to their lower load profile. The annual reduction is 5.6% per MW of wind farm, which is of no consequence unless you are using all the heat from the diesel gensets.

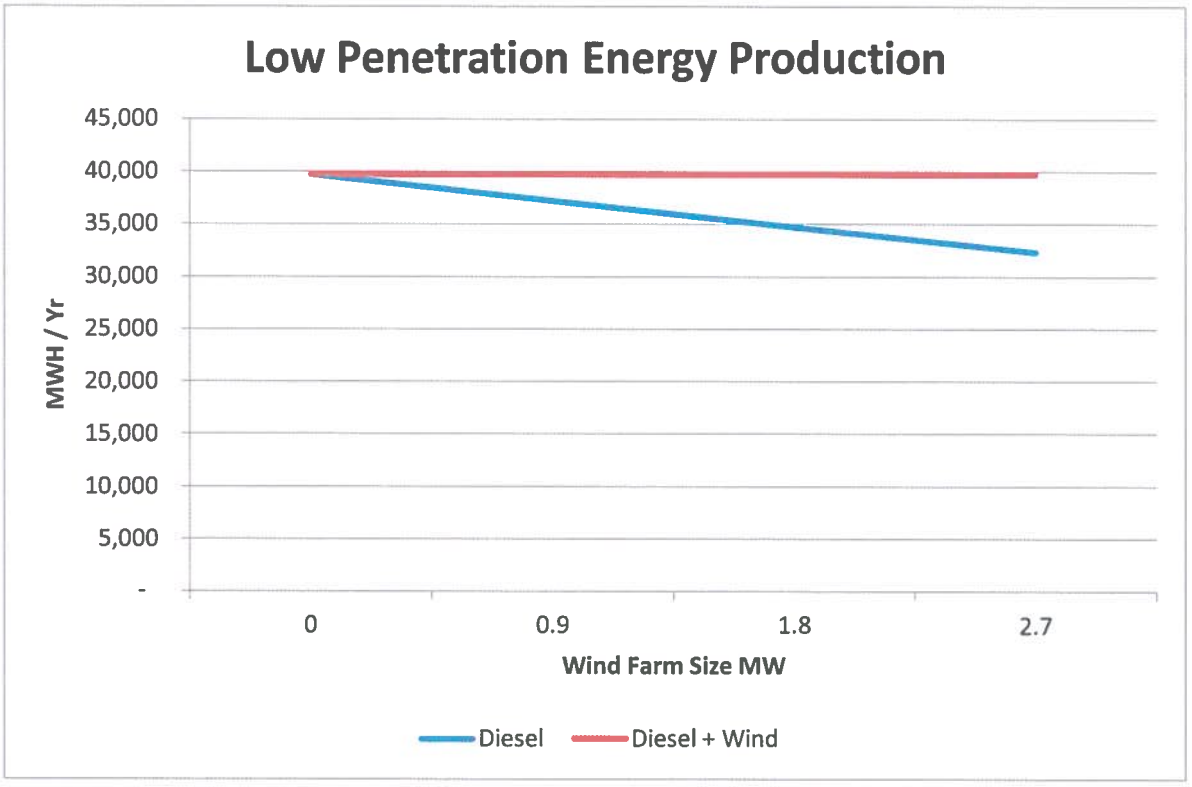


Figure 13: Energy production from low penetration wind farm

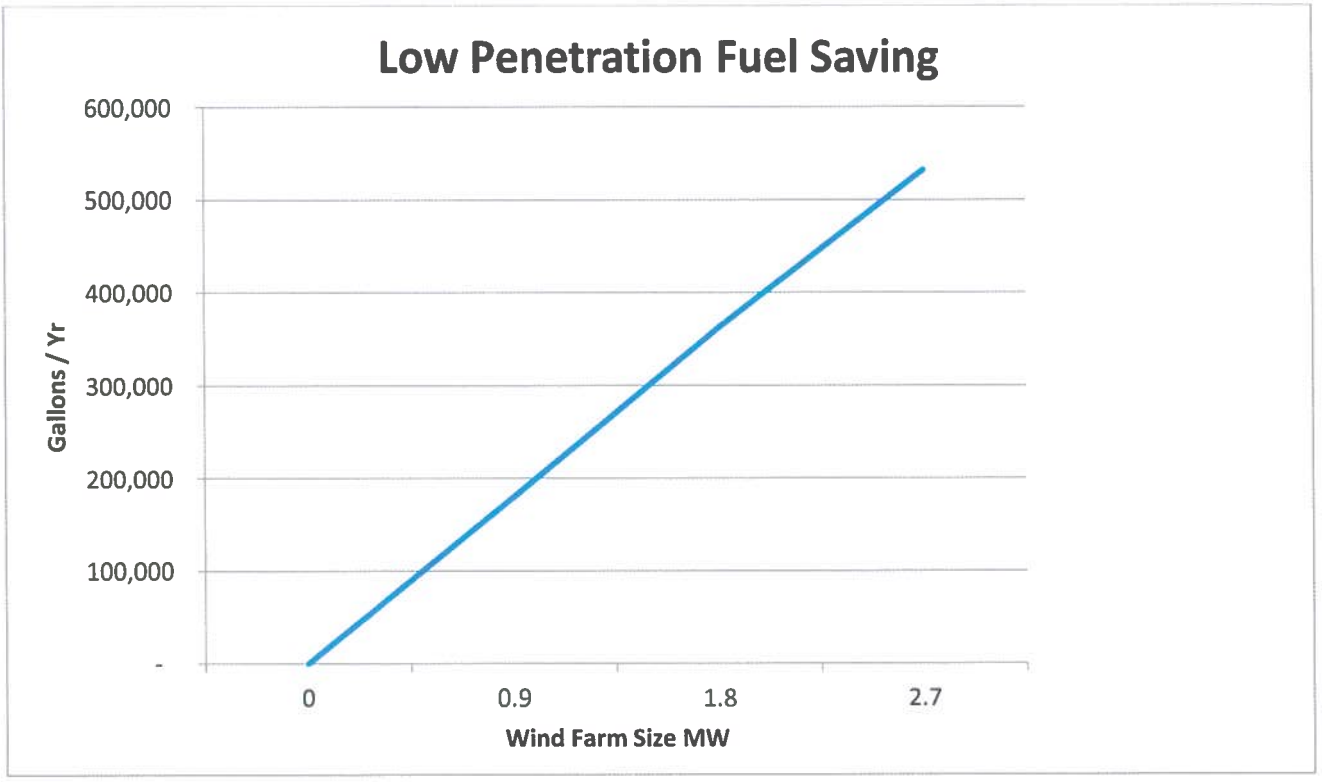


Figure 14: Fuel savings from low penetration wind farm

6.6 Conclusions

A low penetration wind farm is a cost effective, relatively low risk option if limited to less than 2 MW in size and located near a distribution feeder. It will require additional engineering work specifically on the distribution feeder configuration and protection, diesel generator governor and dispatch controls as well as wind turbine power control management system.

7 Medium Level Penetration

7.1 Requirements for Wind Farm Sizing

- Maximum amount of wind with only minor changes to AVEC system:
  - Controllable wind turbine power adjustment optional

- Minor Allowed Changes:
  - Secondary Thermal Loads
  - Transformer upgrades/replacement
  - Improved thermal handling performance
  - Fins, fans, pumps etc
  - Minor upgrades to the Distribution system

- Not Allowed:
  - Power plant equipment or protocols impacts
  - Distribution impacts

Approach:

The limiting factors to a medium penetration system for Bethel will be:

- The current distribution capacity

- The control requirements imposed by the limited flexibility of the existing power plant control system.

With transformer upgrades, wind farms of up to 3 MW on the City Feeder #6 and 2 MW on the Feeder #7 will be feasible.

In addition to the EWT 54-900, the GE 2.4 MW turbine will become a viable option for wind farms of this size. Both manufacturer have fleets in Alaska with excellent track records.

7.2 Dispatchable Thermal Loads

In an electric grid, the amount of power generated must match the demand to operate in a stable condition. In an alternating current grid, the controlling variable to match power is grid frequency. The diesel generators control the frequency closely to 60 Hz by means of governors. If the demand increases, the engines will strain more and the frequency decreases. The governors will notice the deviation and increase fuel to the engines so that the frequency will be again close to 60 Hz etc. In any AC grid, under-frequency occurs when the demand is higher than production, over-frequency when the production is higher than demand.

As wind power penetration increases, the wind power fluctuations that may occur during gusty wind conditions may exceed the governing capacity of the diesel engines and cause unintended frequency excursions in the

electrical grid. This requires fast acting control mechanisms to stabilize the grid. Installing fast dispatchable secondary thermal loads will limit frequency excursions by adding/subtracting electric load in real time to divert excess wind power. With the dispatchable secondary thermal loads shaving off the fast power peaks, the diesel engine governors will be capable to control frequency and their dispatch may be delayed. The excess wind energy would be used for district thermal heating and thus provide useful energy. However, controlling wind turbine output power is still required to curtail power in times when there is little or no thermal demand.

Installation of the dispatchable thermal loads either in the existing utility operated district heating loop or as isolated elements within the electric distribution system should both be considered.

The installation of the dispatchable thermal heaters into the existing district heating loop is an attractive option due to the existing thermal distribution network. However, the current thermal loop needs to be modified to allow for efficient operation, increased performance and security and to be capable of coping with the additional heat. Necessary modifications include a heat exchanger to isolate the district heat loop from the engine cooling water and controlled supply pumps. Without these modifications, adding thermal generation to the loop is not feasible. On a side note, the thermal loop could also be augmented by engine exhaust waste heat using an exhaust heat exchanger installed on the existing diesel units. These measures may prove cost effective in upgrading the capacity of the City heat loop.

Currently, the engines can deliver a peak 6 to 7 MW of heat to the district heat loop with average contribution of roughly 4 to 5 MW. Current use for the Bethel heat loop is estimated at 12,000 MWh/yr, (40,800 MMBTU/yr) which is about half the current estimated available heat from the diesel engines. Therefore, until the thermal demand and the efficiency of the district heat loop is increased, there is little incentive to use the loop as a dispatchable secondary heat load.

The second alternative is to provide thermal energy in the form of electricity to businesses and homes from the excess wind energy available. Either electrical resistance heat sources or heat pumps could be used. These distributed dispatchable secondary loads will require an appropriate control system to modulate the loads depending on the wind turbine power output.

As a mitigating factor, the available thermal power from the gensets decreases proportionally as the wind farm size is increased and diesel generated power decreased.

As the following graph illustrates, the thermal energy from the diesel engine decreases and excess wind energy increases with increasing wind farm size.

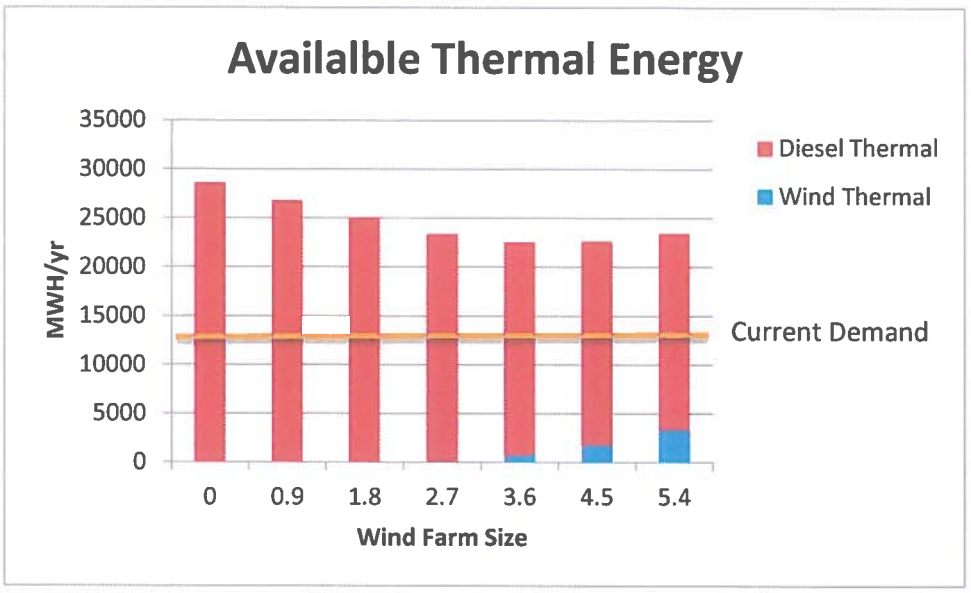


Figure 15: Thermal energy from medium penetration wind farm

Even if the thermal loads would double, the combined output of the recovered diesel engine- and excess wind energy would still provide sufficient heat, resulting in additional economic benefits.

There will be periods, when the thermal energy available exceeds the load demand (no thermal storage was envisioned in this exercise).

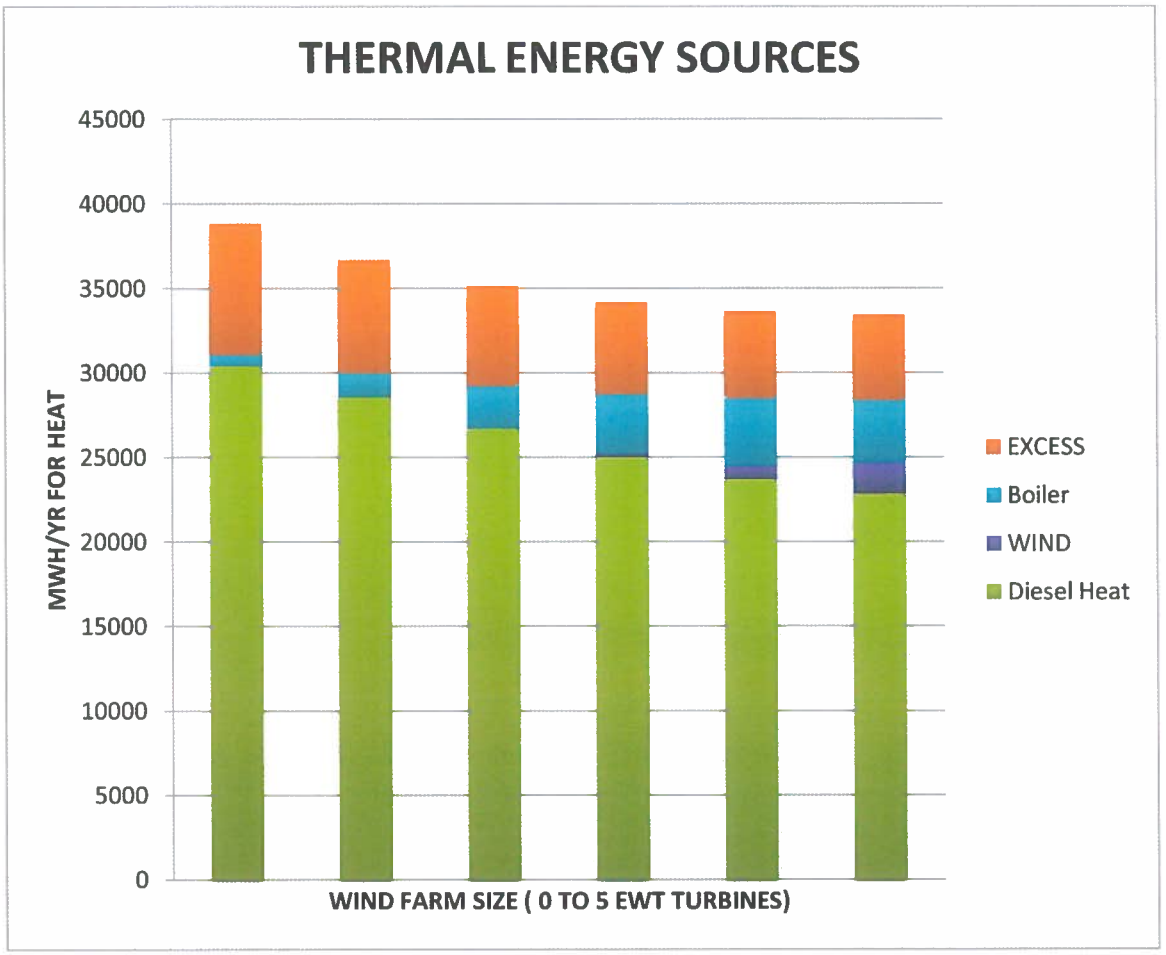


Figure 16: Thermal energy sources with medium penetration wind farm

7.3 Electrical Distribution

The rating of the currently installed transformers would limit the max wind farm sizes to 3 MW for the city site and 2 MW for the KYUK site for a total of 5 MW. Upgrading or replacing the transformers would allow for the increased power on the distribution lines due to the wind farms. The distribution line conductor limitations are approximately twice this much.

If the transformers were upgraded (additional fins, fans or related thermal improvements) or replaced with new transformers, then the maximum capacity would be approximately 3 to 3.5 MW on the KYUK feeder and 4 MW on the City feeder for a total of 7.5 MW. This limitation is imposed by the distribution wiring and voltage control requirements. Further study needs to be undertaken to confirm that the power plant bus can accommodate higher feeder capacities.

7.4 Performance Summary

The primary value of the proposed wind farms in the medium penetration range is both a reduction in diesel fuel consumption and a thermal energy source for secondary loads.

Medium penetration level is between 2 and 5.5 MW based on the AVEC criteria for the penetration levels. At the upper limit of the medium penetration spectrum, 5.4 MW, the wind energy is carrying about 30% of the total annual load and reducing the run time of the diesel generator fleet from 24,000 hours to 20,000 hours per year.

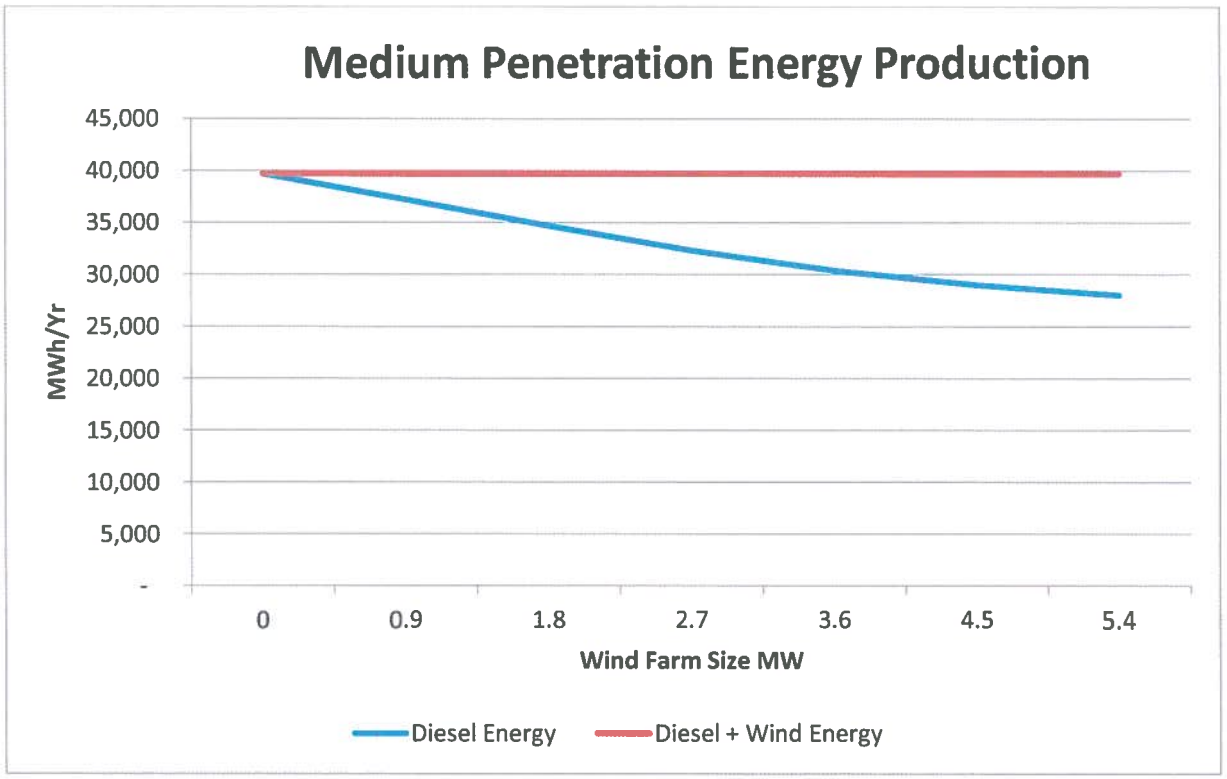


Figure 17: Energy production medium penetration wind farm

In addition, a 5.4 MW wind farm would be curtailing energy to avoid under-loading the diesel gensets in the powerhouse and this energy could be made available for heating purposes. At 5.4 MW there is 3,286 MWh of excess wind energy available annually for district heat during the heating season. (11,172 mmBTUs)

The annual fuel reduction (without accounting for icing) for a 5.4 MW system is 843,000 gallons per year. The heat output of the diesel generators will be significantly reduced due to higher level of wind contribution. The annual diesel engine heat reduction is projected to be 29%. This could have operational and financial impacts if

the district heat system were fully utilized. However, the district heat is currently not fully developed, so that this reduced heat production would be of no immediate consequence.

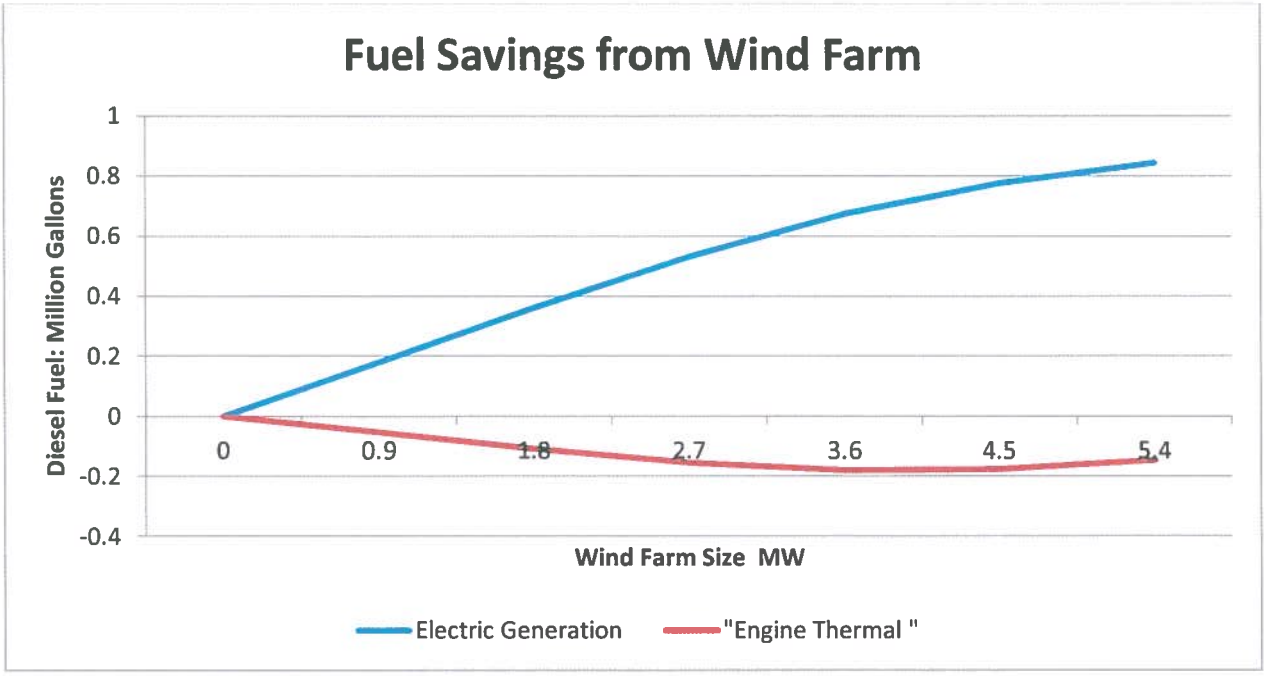


Figure 18: Fuel savings medium penetration wind farm

7.5 Conclusions

The Medium size wind farm has some technical challenges and represents a project that would have significant impact to the Bethel region. It will require design changes to the thermal loop and integration of dispatchable secondary loads. This presumes that adequate additional thermal customers are available and willing to pay a reasonable rate for thermal energy. Depending on wind farm site(s), this option could be deployed with maximum sized wind farm sizes up to 3MW per feeder, after feeder upgrades.

If two wind farms and two different feeder were used, than a total of about 6 MW from both proposed locations could be deployed.

8 High Level Penetration

8.1 Requirements for Wind Farm Sizing

- Define Limitations in the current system
- Propose Work-Around for each Limitation:
  - Define Size Limits of Wind Farm post change
- Limitation Identified:
  - Distribution System
  - Power Plant
    - Diesel Gensets Controls
    - Thermal Sales
- Not Considered Viable at this time:
  - Diesel Off Mode Operations
  - Large Scale Electrical Storage

8.2 High Penetration within the imposed limits

8.2.1 Limitation and Potential Solutions:

8.2.1.1 Distribution, Transformers, Protection, Bus Connection

The maximum wind farm size is limited by current feeder capacity. The full scope of changes considered was transformer upgrades, new larger conductors, protection equipment and power plant buss connection upgrades. A more detailed analysis will be required to accurately define the scope and the final capabilities, but a range of 3 to 5 MW seems reasonable.

By utilizing the maximum capacity of the feeder, active VAR support to maintain voltage within an appropriate window will most likely be required. This capability might be an internal function of the wind turbine, or a dedicated external device connected to the feeder.

For larger capacity wind farms, a trade-off analysis between rewiring the distribution, changing the distribution voltage with the same conductors, or building a new feeder will need to be considered. For a large wind farm (10 to 20 MW) a new dedicated feeder run from the wind farm to the powerhouse is advisable.

The larger wind farms will produce an abundance of thermal energy. To make best of this, the district heating system in Bethel would need to be expanded. This expansion could be accomplished by increasing the capacity of the existing thermal loop system or with distributed dispatchable thermal loads. TDX will be exploring these options in the near term.

Incorporating dispatchable electrical heating equipment may be a viable approach and may be economically competitive to the district heat thermal loop. The advantages of distributed dispatchable electrical heating would be

a) No expansion of the current thermal loop customer base or thermal loop infrastructure needed
b) Serving new customers not located close to the thermal loop
c) Very reasonable installation cost
d) Thermal storage can be part of the electrical heating package, i.e. Steffes heaters, DHW tanks.
e) Increase utilization of the electrical distribution grid

For the High Penetration scenario, the size of the future wind plant is dependent on the size of the thermal load and the thermal distribution system.

The upper limit is defined by the current transformer ratings on both of the likely distribution circuits. Even after transformer upgrades, they will likely remain as a limiting element. Deploying a controllable power set point on the wind turbines to curtail energy production could also help manage distribution system overloads during situations of high wind and low load without needing to shut down the wind turbines fully.

To evaluate the expansion of the thermal customer base, a market analysis of the potential thermal load on a feeder by feeder basis needs to be undertaken. This analysis would need to identify the potential market size, market price for dispatchable heat and implementable business models. Currently this is not within the Scope of this project, but it must be considered if a larger wind farm is being contemplated.

8.2.1.2 Automatic Diesel Genset Dispatch

As the wind farm increases in size, and with the caveat that the system will not be run in Diesel-Off mode, there is a fundamental limitation in the speed of diesel engine dispatch, that won't be overcome until automated genset controls are deployed. Automated dispatch- and genset control would provide for faster start/stop and dispatch times from currently 20 to 30 minutes to about 5 minutes or less. This has potential to save additional fuel, facilitate faster engine dispatch to be able to better follow load variations and provide greater flexibility for the operators.

The EMD diesel engines were never intended for automatic start/stop and dispatch and demand a high dgree of operator intervention. Start/stop and synchronization are still fully manual. An automatic synchronization system was tried in the past but abandoned. Further investigation is needed to evaluate the effort and cost involved to modify the EMD diesel engines so that they can be started, dispatched and stopped automatically without operator intervention.

While the EMD diesel engines are well maintained and operated, they are based on 1950's technology and far behind current designs in efficiency, operation cost and emissions.

Replacing at least to EMDs with modern diesel gensets with automatic controls would not only improve the genset dispatch, but would also significantly reduce fuel consumption and operator intervention.

Modern diesel engines are capable to run at lower minimum loads and can ramp-up faster, to make better use of the available wind power. The faster start-up and ramp rates will result in lower diesel run times, further reducing fuel consumption.

8.2.1.3 Thermal Sales

Thermal sales by the utility represent a significant opportunity in Bethel. Historically, the utility has provided thermal district heat energy at a competitive price from diesel engine waste heat. Converting wind energy to heat uses proven technology. The value of the wind energy as heat is not as high as electrical energy, but it still has a significant value.

Wind power used to offset diesel fuel in electrical generation is equal to roughly the price of fuel divided by the diesel engine conversion rate. At 14 kWh/gallon conversation rate and a local price of $5/gallon, the wind energy has a fuel-offset value of 36 cents/kWh. (Utility bulk delivered price)

With resistive heating, the value of wind generated electricity is about 16 cents/kwh if oil were selling for $6/gallon. (Customer delivered retail price)

If heat pumps were deployed with an average Coefficient of Performance in the 2.5 range, than the wind energy would be worth 36 cents a kWh using diesel fuel $5/gallon.

Clearly, the value of wind energy as a heating option appears to be a viable, economically attractive reason to expand the wind farm size beyond that which might be justified by the reduction in electrical generation cost alone.

Value of Thermal Energy to End Customer					
Heating Oil					
Price of Fuel	$/ Gallon	$4.50	$5.00	$5.50	$6.00
Value of Heat	$/ Therm	$3.82	$4.24	$4.67	$5.09
Wind Energy to Heat		Equivalent Cost for Electricity			
Resistive	COP = 1.0	$0.13	$0.14	$0.16	$0.17
Heat Pump	COP = 2.5	$0.33	$0.36	$0.40	$0.43
Notes:	Therm = 100,000 BTUs				
	Oil Heater have 85% efficiency				

Table 8: Thermal energy value

The table shows the cost of thermal energy for two difference electrical sources of heat as compared to 5$/gal of heating oil. Using resistive electric heaters, the marginal cost (the cost where the cost of heat delivered is equal) at $5 fuel oil is $0.14/kwh. To present an economically attractive alternative to the customer, the excess wind energy would have to be sold to them at a price lower than $0.14/kWh.

Similarily, if heat was provided from excess wind energy using a heat pump, the customer could pay $0.36/ kwh for this thermal energy and be at par with thermal energy at $5.00/gallon of fuel oil.

The use of a heat pump, which might be practical in a number of discrete loads in Bethel, has enhanced economics due to the significant efficiency gain from that technology. Commercially available heat pumps have been used with good success for many years in moderate climates. However, at this time there is not enough operational experience with these units in harsh Alaskan environments. The technology clearly has promise, but at this time, it is not ready for deployment in rural Alaska. TDX would recommend a development and demonstration program be undertaken by AEA to validate the use of heat pumps in Alaskan environments.

See also 9: Heat Pump Evaluation.

As mentioned before, the current district heat loop will need to be upgraded and possibly expanded to include new customers. AVEC is currently evaluating these issues. The unknowns of the Bethel thermal energy market will need additional study to evaluate the business options. From an economic and environmental point of view, there does appear to be an attractive opportunity to exploit wind energy for serving additional thermal loads.

8.3 Conceptualization of a 10-20 MW Wind Farm

Currently there is one identified site west of the airport with sufficient land for a 10 to 20 MW wind farm. Given the location and distance from the powerhouse, a separate MV distribution feeder will be required. To take advantage of the wind power, a major expansion of the thermal energy delivery system will be required. It may involve both district heat loop expansion and distributed dispatchable electric heating appliances. For the purposes of this study, we will assume sufficient viable thermal loads exist.

The powerhouse can remain in its current configuration, using only dispatchable load controls backed up with wind turbine set point control to provide sufficiently robust and fast load matching for the wind energy. In this configuration, two 2.2 MW EMD diesel genset will always be running to provide voltage and frequency reference, therefore not requiring a newer automatically dispatchable diesel engine nor electrical storage, however there is concern that the governor response of the EMD engines will not be sufficient to keep the grid frequency within acceptable limits. This issue clearly needs more research and investigation before contemplating this large a wind farm.

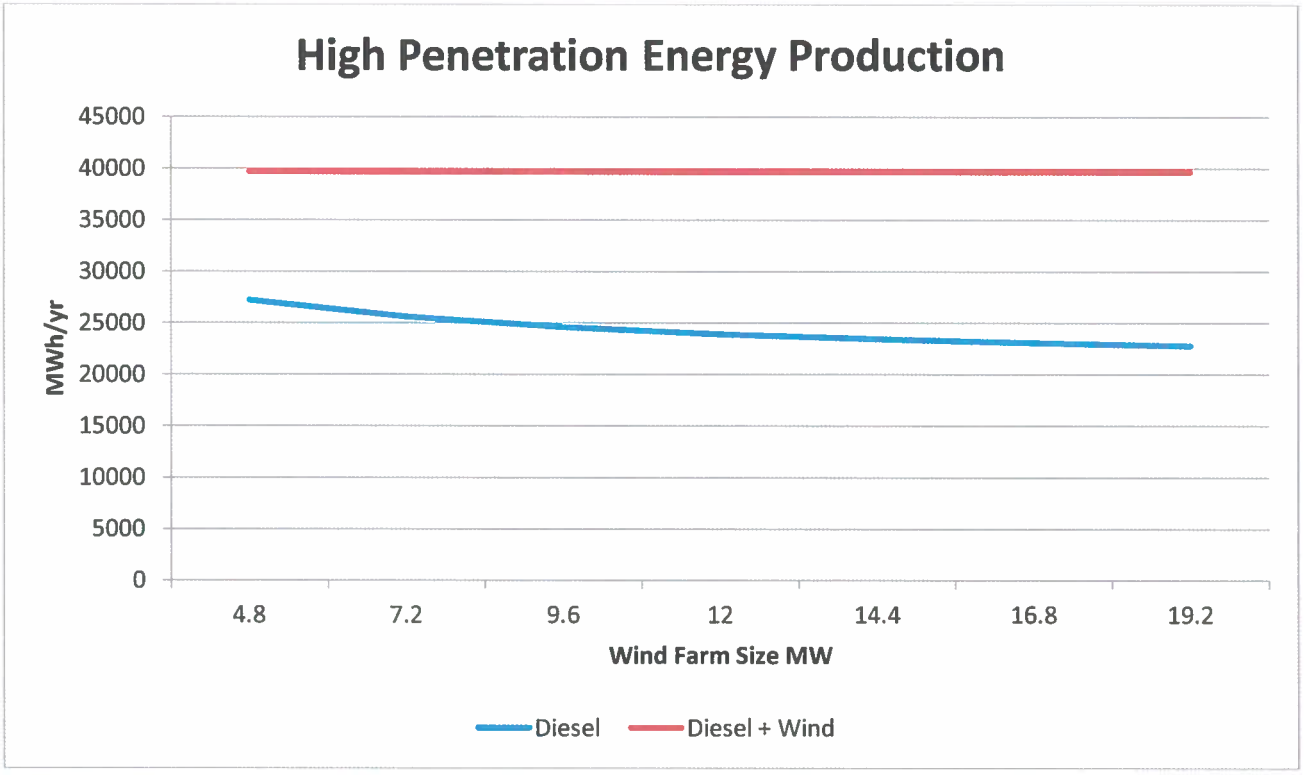


Figure 19: Electrical energy production high penetration wind farm

The model of the large penetration wind farm is hampered by the constraint to always keep two EMD engines operating at all time. Once the wind farm produces more than 7 MW, there are no additional fuel displacement saving since the diesel plant's output can't be lowered. In this scenario, the only use for wind energy above 7MW is to convert it to heat.

With this, there will be a significant amount of energy available for heating. However, there is still enough waste heat from the diesel engines to power the current thermal load customers.

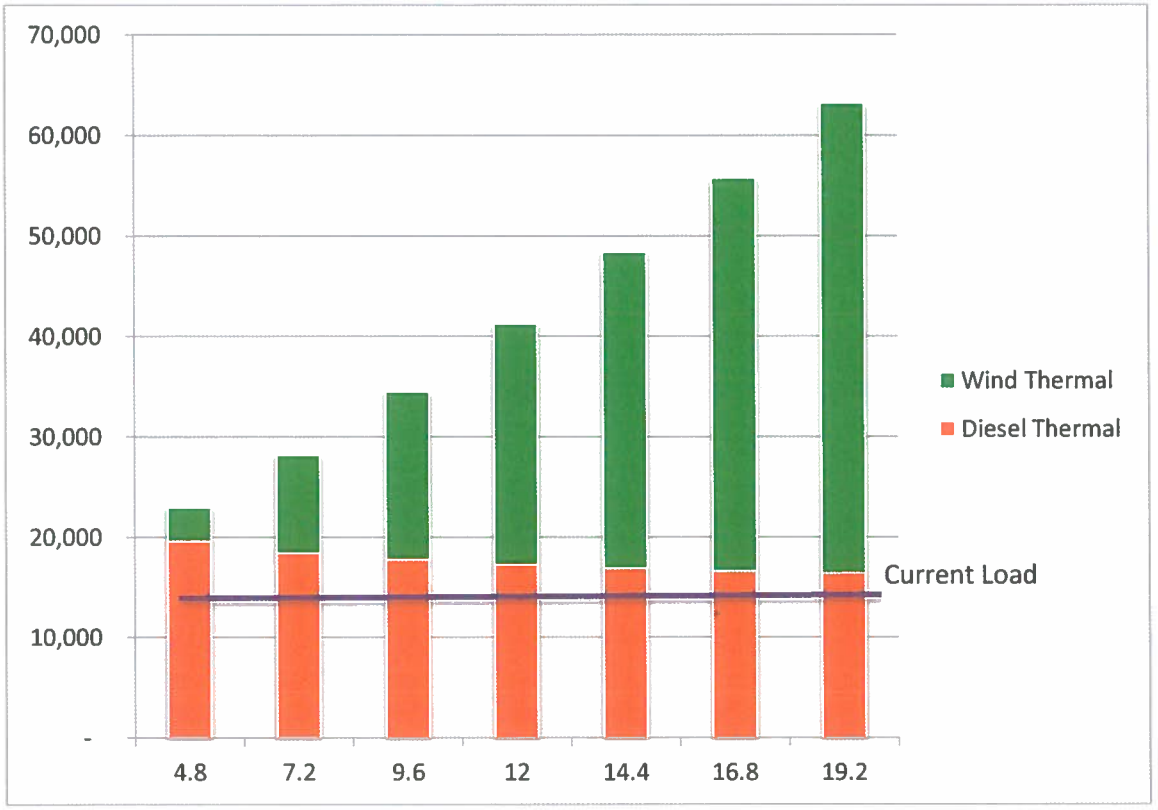


Figure 20: Thermal energy production high penetration wind farm

At 10 MW the analysis shows at 1.1 million / year gallon fuel savings from the wind farm plus another 200,000 gallons of heating oil if resistive heater were deployed.

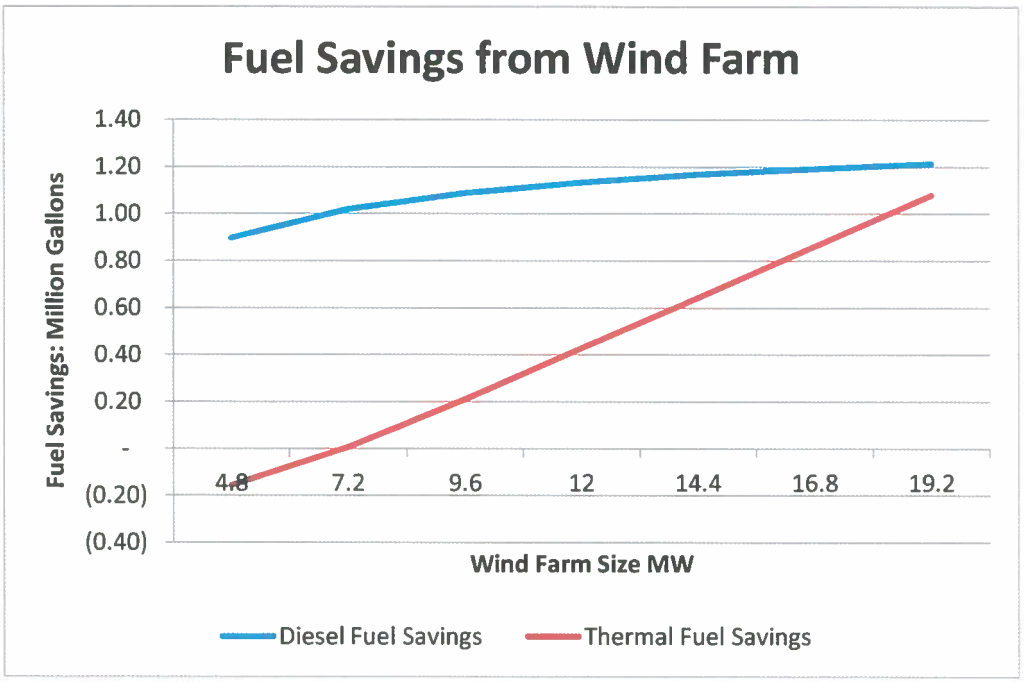


Figure 21: Fuel savings high penetration wind farm

8.4 High Penetration with Diesel-OFF periods

Designing isolated village power systems to run without any diesel operating has been the goal of many power engineers for years. Several such wind-diesel systems, with and without energy storage, have been recently deployed with good success in Alaska. To be able to run in wind-only mode, the wind farm capacity must be considerably larger than the base electrical load and the system is best configured to use the 'excess' wind power to satisfy other local needs. In Alaska this need is thermal energy.

Therefore, we have modeled these high penetration system with the ability to operate without any diesel generators when sufficient wind energy is available to cover the entire electrical demand. The model includes 10% load reserve and a 25% wind reserve, to provide sufficient buffer for starting and synchronizing a diesel genset when wind conditions change quickly.

This effort was not an exhaustive design exercise but a cursory review of the performance of this configuration.

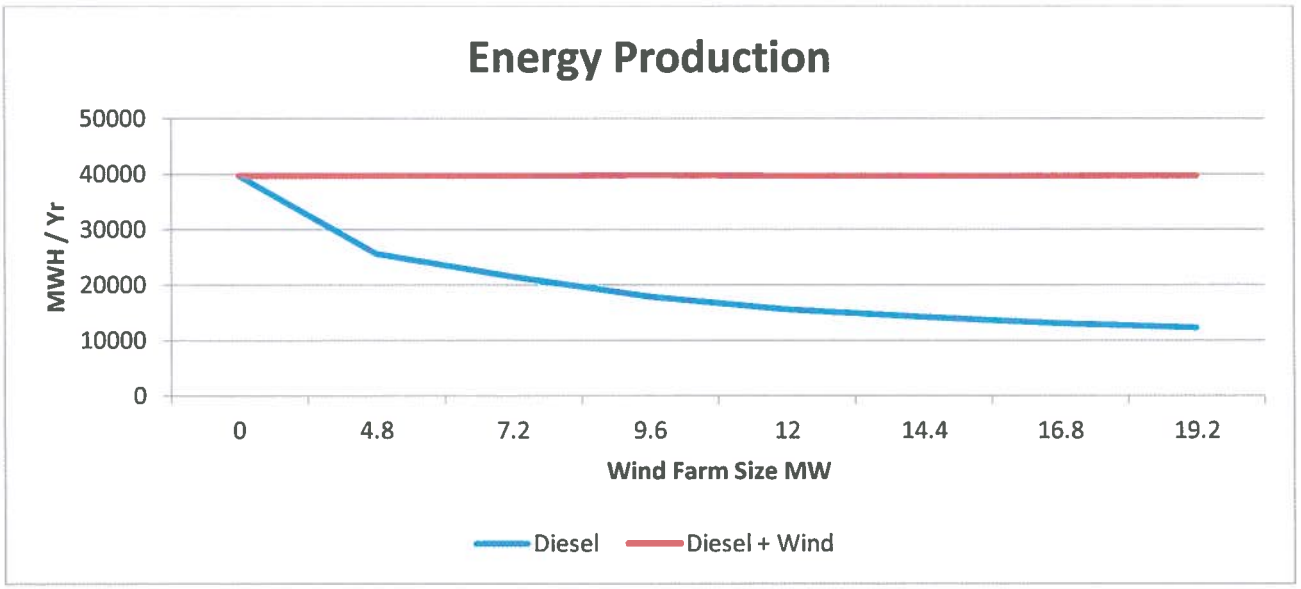


Figure 22: Electric energy production high penetration WF w/ diesel-off

Allowing the diesels to turn off, increases the fuel savings significantly. There will always be times that require the engines to operate because there is not always enough wind available. We found that a wind farm size of around 20 MW would maximize the fuel savings, with wind energy delivering about 70% of the annual electrical energy. This represents considerable fuel savings compared to a similar size wind farm with diesel engines running at minimal load.

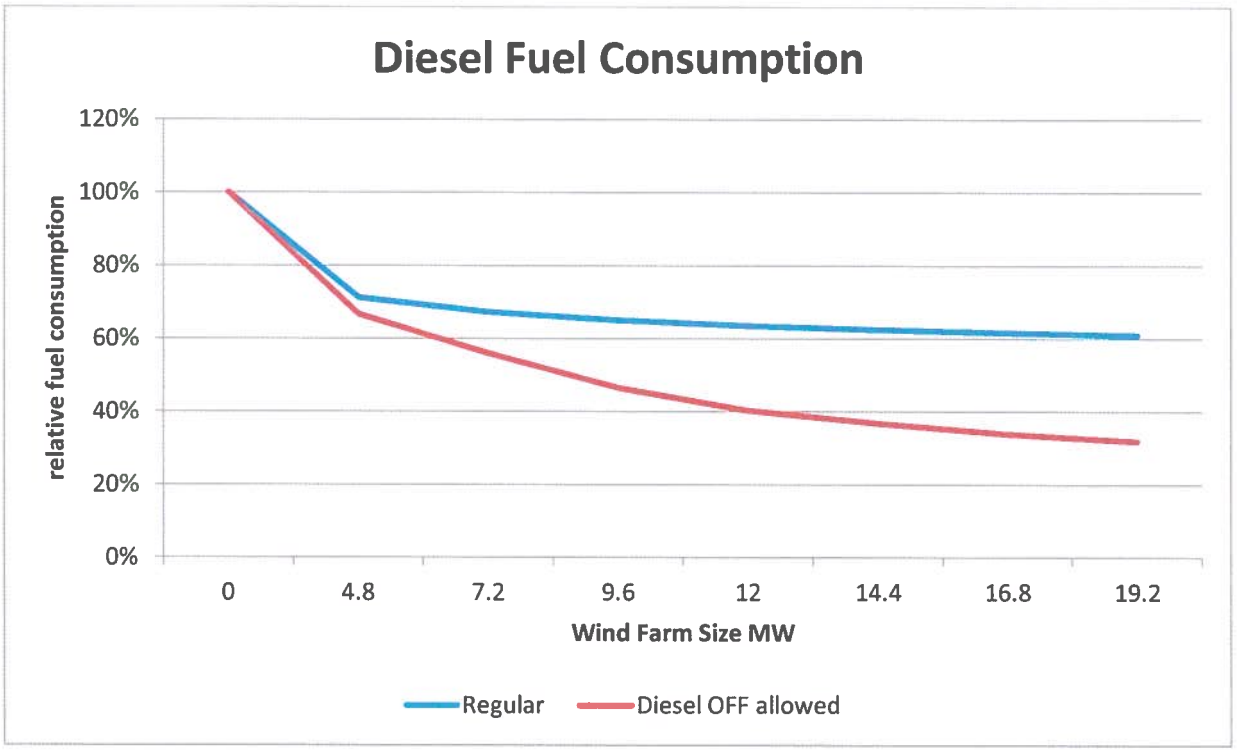


Figure 23: Relative fuel consumption high penetration WF w/ diesel-off

In addition, there would be wind energy available for thermal loads, however much less than in the non wind-off operating scenario since most of the energy would be used to displace diesel fuel.

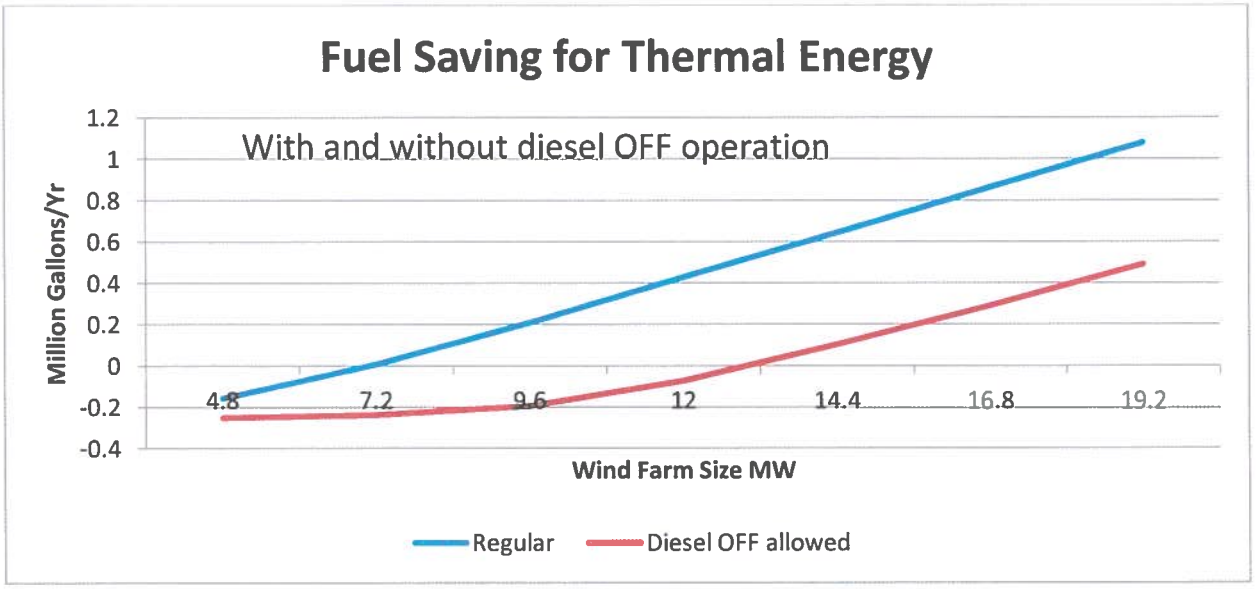


Figure 24: Fuel savings for thermal energy high penetration WF w/ and w/o diesel-off

The combined savings from both uses of the wind energy is about the same regardless of the operating choice with only a 300,000 gallons/yr difference.

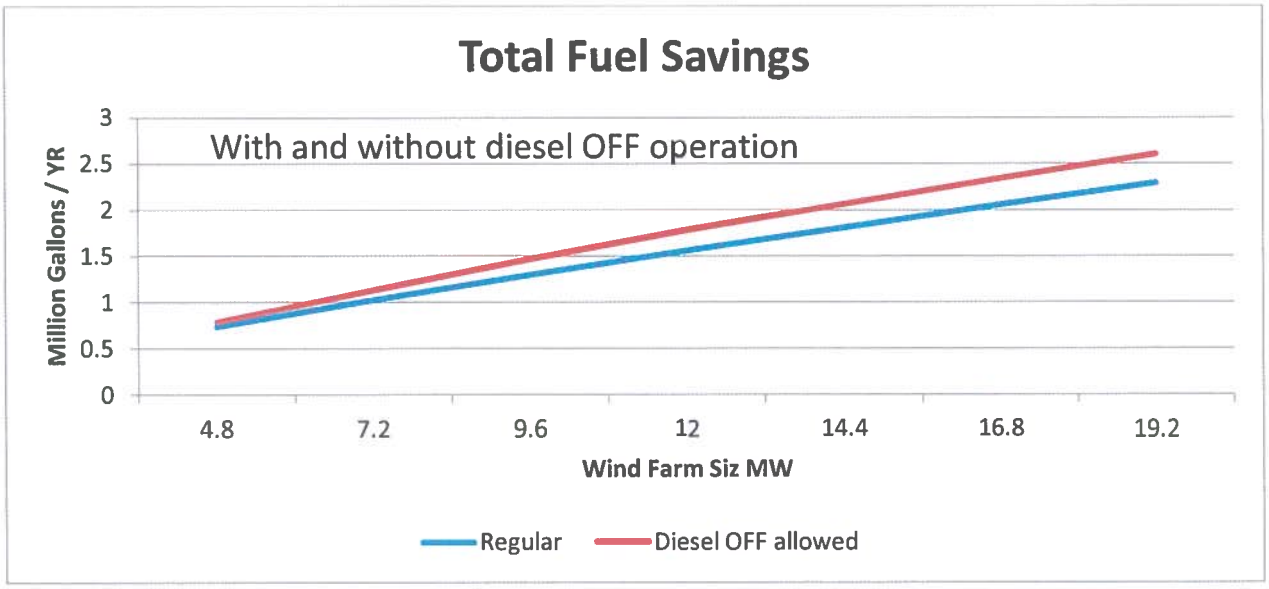


Figure 25: Total fuel savings for high penetration WF w/ and w/o diesel-off

The actual design of the controls- and auxiliary components to make automatic operation of the system with diesel OFF capability possible, has not been undertaken at this time. It will require advanced controls, fast dispatchable loads, automatic dispatchable diesel engines and probably electrical storage.

There are examples of this type of system that have been successfully deployed that may serve as models, if this configuration were to be pursued.

9 Heat Pump Evaluations

9.1 Introduction:

The use of heat pump as distributed dispatchable thermal loads within wind-diesel power system appears to be an attractive option to be considered for medium to high penetration wind system for Bethel. We will focus on a review of the existing Alaskan experience with heat pumps in general and then address the particular issues related to incorporation within the wind-diesel power systems envisioned for Bethel.

For the Bethel application, we limited our review to air source heat pumps, since the water source heat pumps would have significant geographic constraints, while the air source heat pumps would be universally useful, assuming climatic conditions are appropriate.

9.2 Alaskan Experience:

Heat pumps are not new technology, however recent advancement, allowing operation at lower outside temperatures, make them attractive potential heating sources for rural Alaska. Both air and water source heat pumps have been used already in SE and SW Alaska with excellent results. CCHRC (Cold Climate Housing Research Center) in Fairbanks has compiled reports on existing applications, primarily smaller Mini-Split systems, however there are a number of larger commercial system installed or in the planning stage.

The CCHRC concludes that heat pumps have an important role to play in satisfying Alaskas thermal energy needs in the appropriate climatic regions of the state. See attached CCHRC reports.

BETHEL AP, ALASKA (500754)

1981-2010 Monthly Climate Summary

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	13.8	17.3	23.0	34.2	50.5	60.9	63.2	59.8	51.9	36.1	22.5	16.5	37.6
Average Min. Temperature (F)	1.8	4.4	8.3	19.1	33.3	43.7	48.5	46.8	38.8	24.9	11.2	3.8	23.8
Average Total Precipitation (in.)	0.85	0.72	0.72	0.78	1.12	1.63	2.39	3.25	2.71	1.76	1.51	1.10	18.5

Table 9: Bethel average monthly climate data

Bethel long term outdoor temperatures records show that the new low temperature air source heat pumps may be applied successfully. The coldest winter temperatures in Dec, Jan and Feb are all between 0° and 5°F, which is within the lowest range for newly developed heat pump models. Generally, the COP of any heat pump unit decreases as the temperature drops. Specific performance must be evaluated on a unit by unit basis but there are many units which have a COP of around 2 at 5°F increasing to above 3 at 47°F.

9.3 Economics and Values:

Heat pumps use electrical energy to transport heat from a lower temperature source to a higher temperature load. Their by-product is very cold air which could also find use in some applications, like grocery stores with both space heating and walk-in cold storage space needs.

Air-to-air heat pumps are now one of the most common appliances in the lower 48, where they provide both thermal heating in winter and cooling in summer. In Alaska, summer air conditioning is not of value. Air to air heat pumps come in many different sizes to heat small rooms up to large commercial complexes in a myriad of configurations and manufactures. Operating under conditions found in SE and SW Alaska, the Coefficient of Performance (COP) for the newest heat pumps can average from 2.5 to 4 depending on outside temperatures.

In rural Alaska air-to-air heat pumps have not been considered appropriate because of the high cost of diesel generated electricity. The constrained capabilities of most rural utilities, the cost of power generation and the state tiered subsidies for electrical power makes heat pump choices impractical from both the users- and the suppliers point of view.

However, in a wind-diesel application where "excess" wind energy is used to power this "secondary load", this situation changes dramatically.

The cost of heat in rural Alaska is primarily tied to the cost of heating fuel, which is priced close to diesel fuel. With normal oil furnace heating efficiencies of 85%, a gallon of heating fuel can deliver approximately 118,000 BTU of useful heat. Fuel cost alone (not accounting for the cost of the furnace, ducting, controls and maintenance) is $42.37/MMBTU (million BTU).with fuel oil at $5/gal.

Heat pumps using "excess" wind energy with an average COP of 3, will require 98 kWh of electricity to deliver a million BTUs. To achieve cost parity with fuel oil at $5/gallon the wind electricity has an equivalent value of 36 cents/kWh.

However, a more comprehensive cost analysis should include the upfront cost and maintenance of the heat pump, since existing buildings already have the oil furnace infrastructure is in place. When calculating true parity energy cost, the cost of both systems must be included. Developing full economic models is outside the scope of this project but it appears reasonable to assume that utilizing the "excess" wind energy in this manner will be highly competitive to fuel oil thermal energy.

The cost of wind power at rural Alaskan sites varies widely based upon the wind resource, the cost of the wind farm installation and related maintenance costs. For the City of Bethel, assuming a medium to high penetration wind system, the projected Cost of Wind Energy (COE) has been calculated to be approximately 15 to 20 cents/kWh. On St. Paul Island, TDX is selling wind power to the City for 14.5 cents/kWh from a 500 kW wind farm.

However the wind farm operator would prefer to price the 'premium' product, wind energy that replaces diesel fuel. The true value of this energy, is the value of the diesel fuel it replaces in the power plant. Currently the Bethel utility efficiency is about 13.5 kWh/gallon. At $5/gallon the wind energy displacing diesel fuel is worth 37 cents/kWh.

9.4 Commercial Air-to-Air Heat Pumps

TDX subcontracted with Vermont Efficiency Investment Corp (VEIC) to investigate the application of commercial heat pump units in Bethel. The focus of the work was to create a data base of suitable makes and models which might be considered, review their performance parameters and understand the application and design process necessary to develop a complete project.

A data base of commercial air-to-air heat pumps is presented as a separate document The data shows that there are several viable options that may be used for a variety of commercial applications in Bethel. Together with the CCHRC and VEIC list of residential units, this data base provides a good starting point for potential equipment selection.

The performance of air source heat pumps are rated across a range of indoor and outdoor temperatures. The outdoor temperature has the highest influence on heat pump performance. Commercial units, especially VRF (Variable Range Frequency) units, will have COPs ranging from 4.5 at 45°F dropping to 2.5...3 at 17°F and allowing a minimum effective outdoor temperature of around 5°F with a corresponding COP of around 2. The data shows that there is a wide variability across makes, models and configurations. For our purposes, we used an average COP as shown in Figure 26 below:

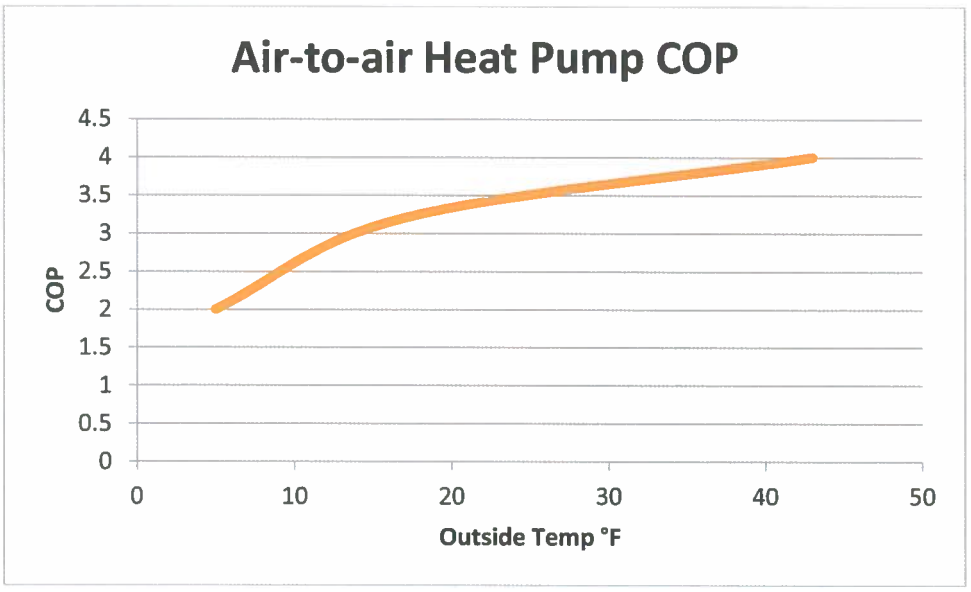


Figure 26: Air-to-air heat pump COP

Temperature extremes for Bethel:

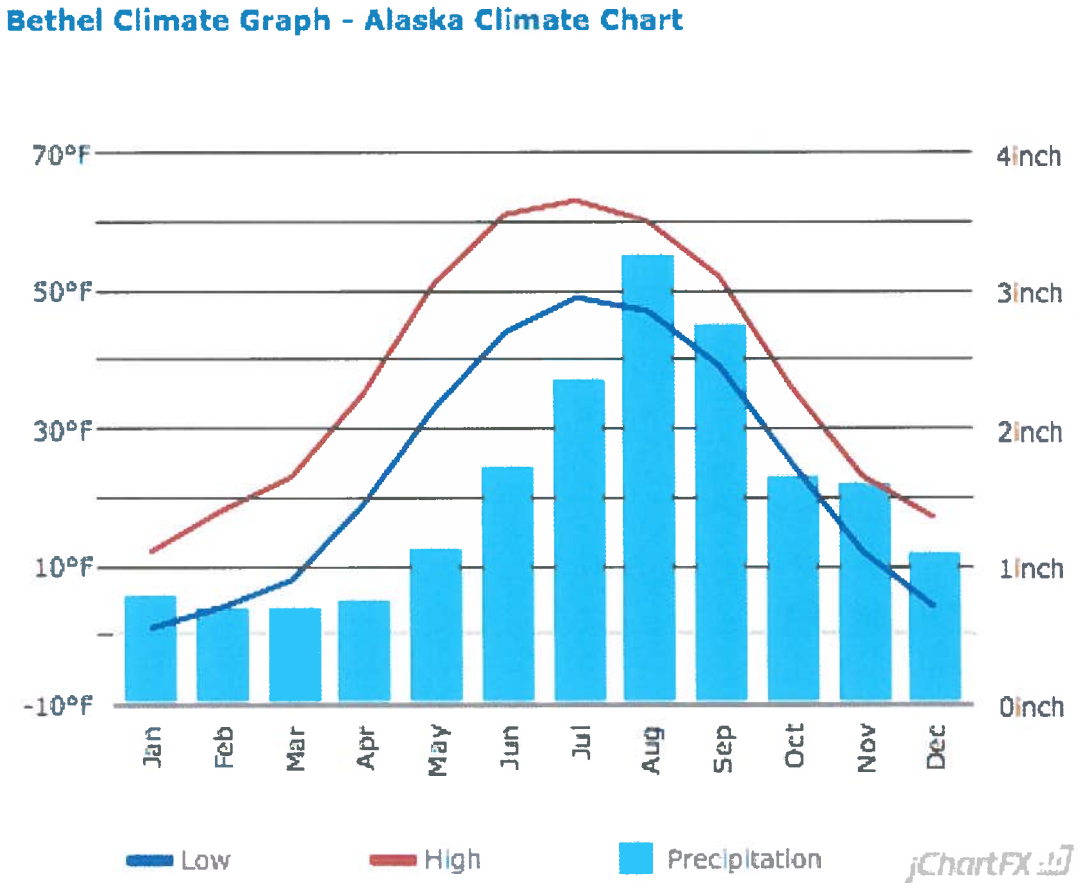


Figure 27: Bethel climate chart

Using the above graphs, the average heat pump COP for the heating season (Sept to May) in Bethel is about 3.2, assuming equal performance each month, which might be on the high side given the reduced heating demands on the shoulder seasons. If heating season is reduced to Oct to April, the average COP drops to 3.0.

9.5 Controls

Utilizing heat pump in a dispatchable load scenario will require system controls that take into account the heat pump power needs in all its operational modes (standby and operating). In addition, the system controller must have appropriate communication interfaces to effectively manage the heat pump systems. Heat Pumps are essentially variable speed motors running compressors, fans and supervisory control equipment.

9.5.1 Communications

Modern heat pumps, whether small mini-split models (single room) or larger VRF (Variable Refrigerant Flow) models (for multiple rooms), typically have monitor- and control inputs/outputs consistent with Home Automation and Building Management Systems (BMS). For our application as a dispatchable load, the units must

at a minimum respond to start/stop commands as well as communicate back the unit's operation mode and power consumption. Although each manufacturer approaches the issue differently, it appears that this basic communication functionality is built into most modern units.

9.5.2 Adapting the heat pump controls for dispatchable load operation

The standard on/off controls within the heat pump will provide the basic control input for dispatchable load operation. This control feature will be implemented by effectively inserting an additional control element inside the heat pump room temperature controls that will be operated by the wind-diesel system controller .

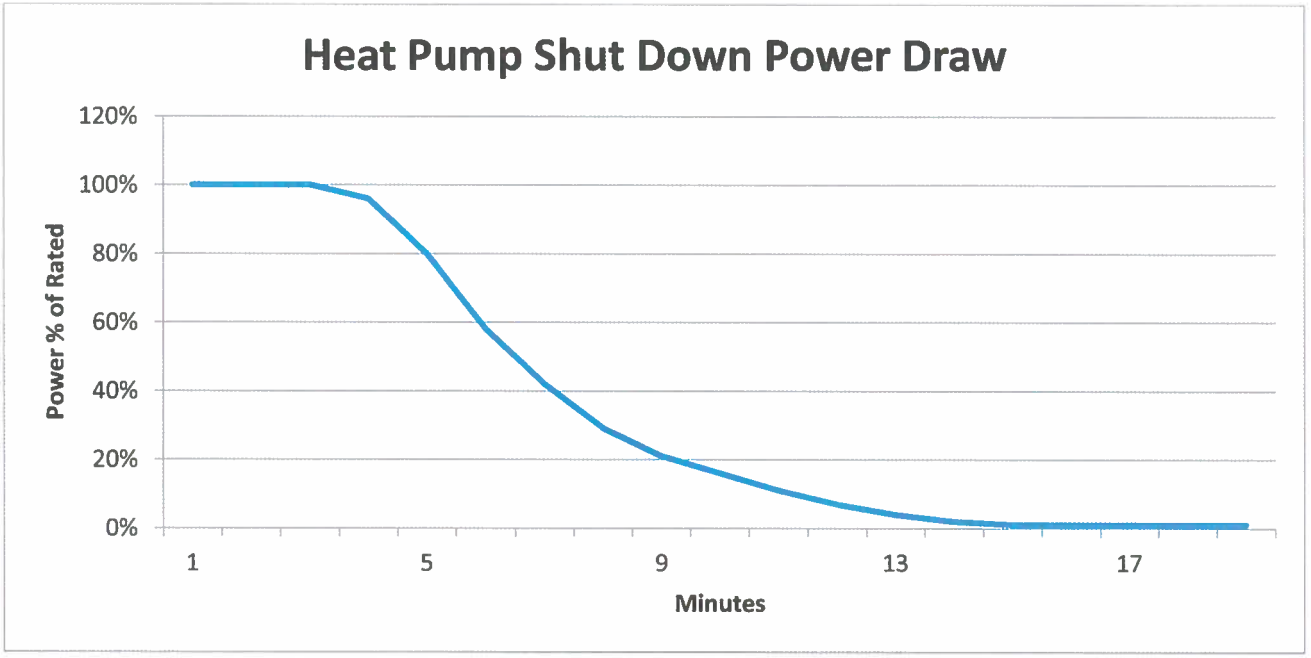


Figure 28: Heat pump shut-down characteristic

9.5.3 System controller

The dispatchable loads must match the "excess" wind energy to prevent the diesel generators powering these dispatchable loads. When utilizing resistive load elements, there can easily be a one to one parity, since the resistive loads can be controlled very quickly and accurately. However, heat pumps require longer start-up and shut-down times and must run for prolonged time to achieve full heat output and efficiency (COP). When utilizing heat pumps, the system controller will need to take into consideration the slow nature of heat pump dispatch and anticipate the wind resource and the amount of energy being consumed by the heat pumps to match the energy flow successfully.

A concern is the shut down cycle for heat pumps, which typically is a decay in power over several minutes, not an instantaneous response to a shut down command. The system controller will need to have a predictive decay function within its control algorithm. Due to the slow response of the heat pumps, the dispatchable load system will most likely require some fast discreet resistive loads to improve response time during fast wind resource transitions.

Depending on the turbulence intensity at the site, the number of turbines and other related factors, the total amount of heat pump loads will be limited; some resistive loads will be needed to insure system stability..

However, some mismatch between excess wind energy and dispatchable loads is expected and results in the following penalties:

a) Short periods of diesel operational below nominal minimum load level
   This is tolerable if limited in duration and severity
b) Short periods where the diesel engines power the heat pump load
   This hurts fuel utilization

Probably the best parameters for evaluating the ratio of heat pumps to resistive loads for dispatchable heat application would be the wind penetration, length (percent) of time dispatchable loads are utilized and turbulence intensity. As wind penetration increases so does the amount of time that dispatchable loads are utilized, therefore favoring more heat pumps. Conversely, low penetration and high turbulence sites will negatively impact the use of heat pumps.

The very low turbulence intensity (TI = 0.09) in Bethel during the heating season (which coincides with the high wind season), would favor the use of heat pumps.

In the three cases considered in this analysis, the following conclusions can be made:

Low Penetration	< 2 MW	No dispatchable loads
Medium Penetration	2-6 MW	Dispatchable loads up to 1 MW
High Penetration	6-20 MW	Dispatchable loads up to 15 MW

Additional investigation will be needed to fully understand the design implications of these variables on equipment sizing and control systems. That work is not part of the Scope of this phase of the contract.

9.6 Modeling System with heat pumps in Homer Pro

Analysis of the impact of heat pumps in Bethel was done by manipulating output data from Homer and adjusting the thermal contribution by heat pumps rather than resistive heating. An average COP of 3 was used for the whole year.

This analysis was done for the High Penetration system where the two diesel generators were required to be running at all times.

We found that there isn't much value using heat pumps when the amount of excess wind energy is marginal, since the devices wouldn't be in service enough to justify the capital investment. Therefore, only High Penetration scenario would favor heat pumps.

Not all the dispatchable load can be made up of heat pumps due to the control limitations and slow response. Some resistive load would be needed to provide more exact load to wind generation matching. For this study it is being assumed that 75% of the total excess wind energy will be consumed by heat pumps. At this level of deployment of heat pumps, the thermal energy available will increase by 250%.

Given this scenario, the amount of thermal energy becomes a significant driver to the overall economics of the project.

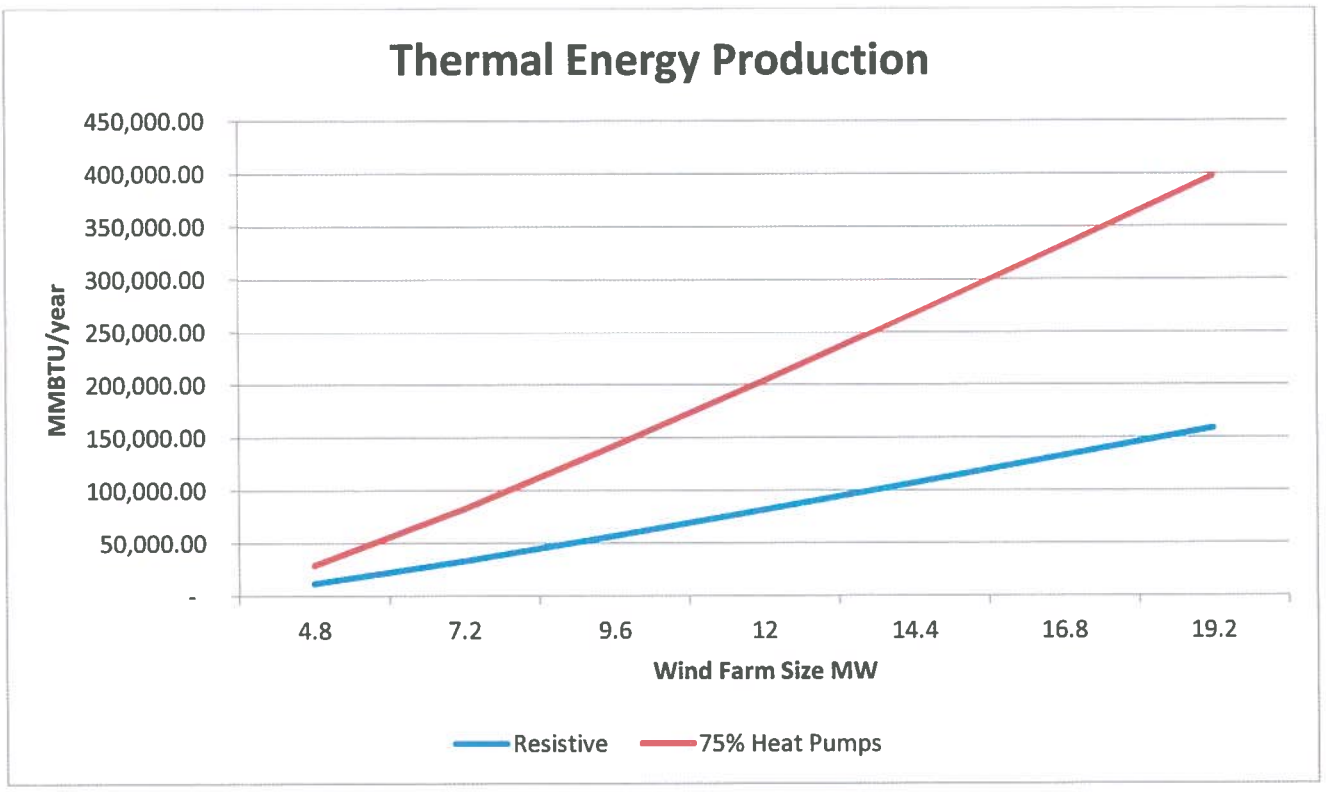


Figure 29: Thermal energy production w/ and w/o heat pumps

For Bethel the conclusion can be drawn, that wind farms below 5 MW have essentially no impact from using heat pumps, since the time these devices are powered up is too short to be economically viable. As the size of the wind farm increases, the value of the heat pumps increases because the amount of wind energy converted to dispatchable heat is more significant.

The heating oil savings from excess wind energy are quite significant when heat pumps are deployed.

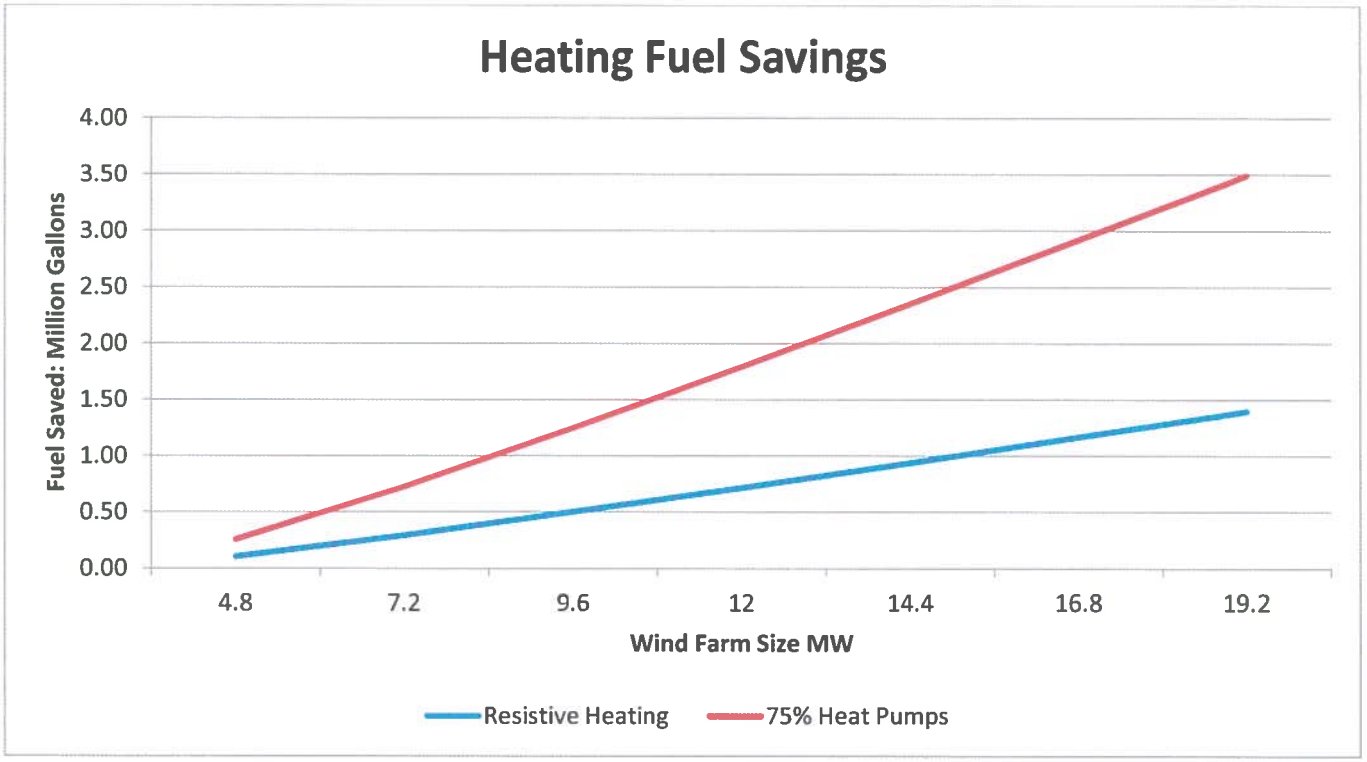


Figure 30: Heating fuel savings w/ and w/o heat pumps

Allowing the diesel generators to be turned off, further increases the effectiveness of the wind farm. When heat pumps are utilized in a High Penetration system with diesel-off mode, about 800,000 gallons per year of diesel- and heating fuel (combined) can be saved.

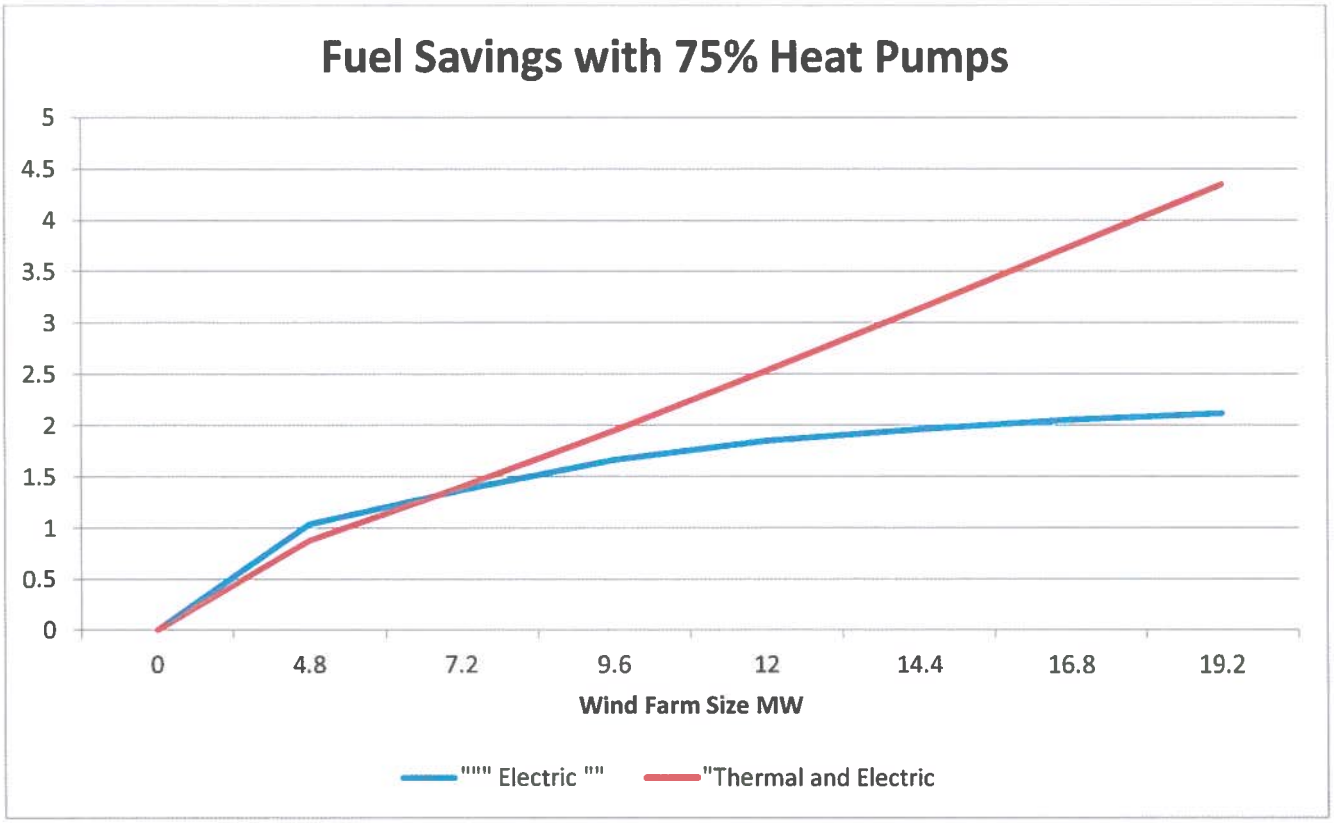


Figure 31: Total fuel savings with heat pumps

9.7 Conclusions

Utilizing heat pumps as dispatchable loads for wind-diesel systems is a viable way to enhance the value of wind energy and allow for higher penetration wind systems to achieve improved economic outcomes. However, the control strategies to achieve these goals need to be developed. Some of these functions are already implemented in advanced wind-diesel controllers.

10 Construction Costs Estimates

Given the limited project details and the cursory scope of this feasibility study, we used overall construction cost data of similar projects in Alaska to estimate construction cost for this project.

A wind project of this scope faces two significant challenges in Bethel:

1. Permafrost
   The soil will require special foundations, similar to the Kotzebue EWT design
2. Transportation and logistics issues.
   While Bethel does have a harbor and wharf capable of off unloading barges (Kotzebue had no harbor), there will be some limitation on transport of heavy large loads through the town. The roadways around the sites will need to be constructed or improved.

10.1 Turbine cost

The recent projects in Nome and Kotzebue with EWT 900 kW turbines, cost between $4.5 and $5 million per MW. This cost is for the turnkey installation of the turbines and includes the connection to the utility gird.

The GE 2.4 MW turbines have not been installed in Alaska yet, but based upon the experience on Fire Island and Kodiak with slightly smaller turbines, we estimate an installed cost in Bethel of about $4 to $4.5 million/MW

These estimates are based on the installation of one or two turbines. Larger projects would certainly benefit from economies of scale due to significantly lower costs of shared logistics, crane and mobilization costs and shared soft costs.

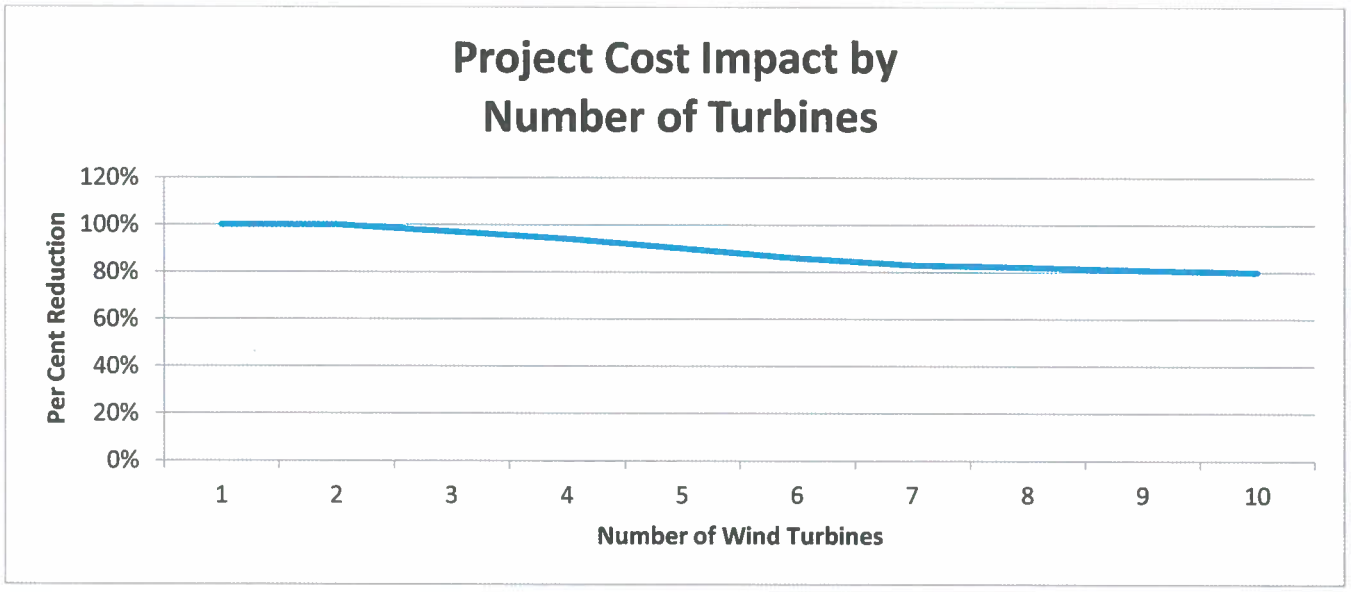


Figure 32: Cost reduction by wind turbine count

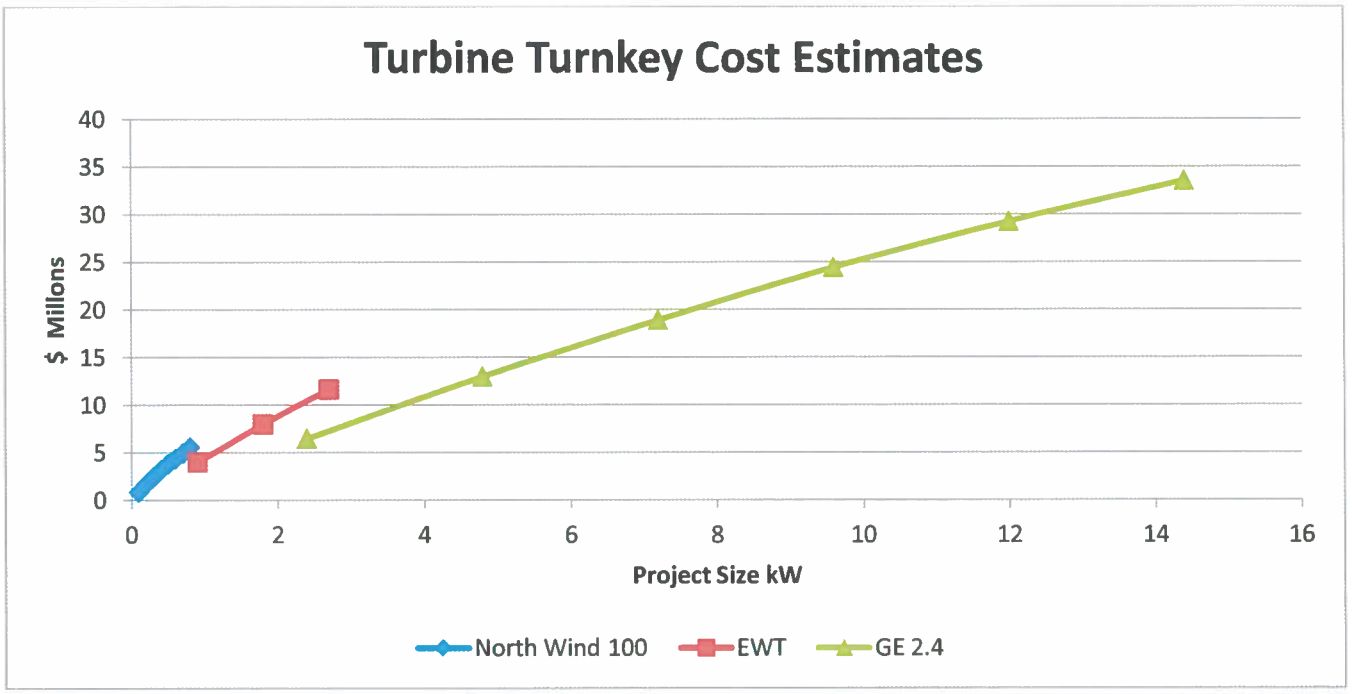


Figure 33: Wind turbine cost estimate

10.2 Project integration cost

Project integration costs, including utility distribution upgrades, system controls, secondary loads, diesel genset improvements, electrical storage, communications etc. have been estimated as shown in the graph below:

Project Cost Estimator

Low Pen MW	Diesel Mods $ mm	Resistive Loads $ mm	Distribution UpGrades $ mm	Comms	Controls	Electrical Storage	Engineer Cnstrn Mgment	Project Mgment	Soft Costs	Totals Millions $$
1	0	0	0	0	0.15	0	0.25	0.25	0.1	0.75
2	0	0	0	0	0.15	0	0.25	0.25	0.1	0.75
Med Pen										
3	0	$0.25	0.2	0	0.2	0	0.5	0.5	0.1	1.75
4	0	$0.25	0.5	0	0.2	0	0.5	0.5	0.2	2.15

5	0	$0.27	0.5	0	0.2	0	0.5	0.5	0.2	2.17
High Pen										
6	1	0.47	3	0.1	0.25	0	1	1	0.5	7.32
7	1	0.67	3	0.15	0.3	0	1.1	1.1	0.5	7.82
8	1	0.87	3	0.2	0.35	0	1.2	1.2	0.5	8.32
9	1	1.07	3	0.25	0.4	0	1.3	1.3	0.6	8.92
10	1.5	1.27	3	0.3	0.45	0	1.4	1.4	0.6	9.92
12	1.5	1.67	4	0.35	0.5	0	1.5	1.5	0.6	11.62
14	1.5	2.07	4	0.4	0.55	0	1.6	1.6	0.7	12.42
16	1.5	2.47	4	0.45	0.6	0	1.7	1.7	0.7	13.12
18	1.5	2.87	4	0.5	0.65	0	1.8	1.8	0.7	13.82
20	1.5	3.27	4	0.55	0.7	0	1.9	1.9	0.7	14.52

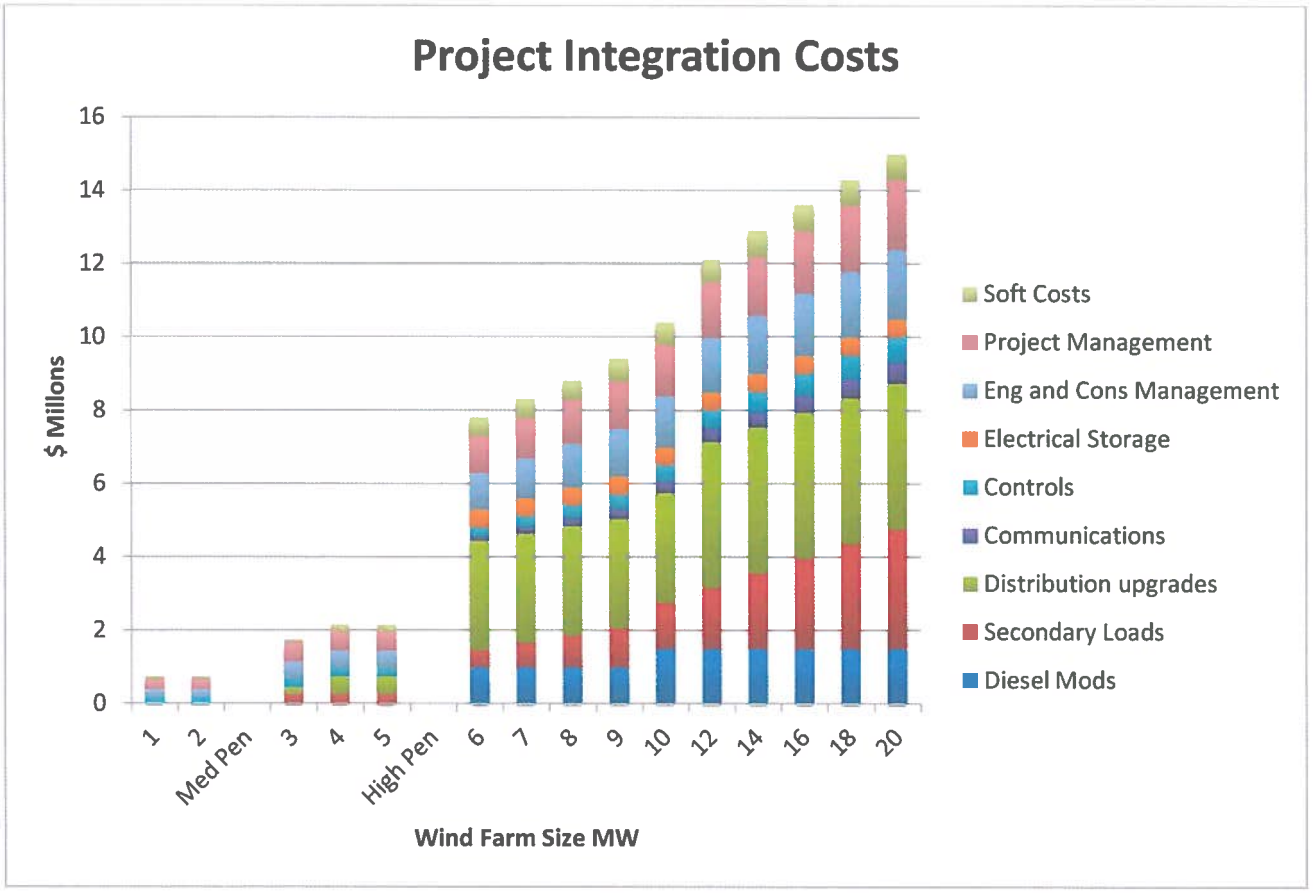


Figure 34: Wind turbine integration costs

10.3 Total Project Cost

Figure 35: Total project cost by wind farm size

11 Financial Projections

For this feasibility study, a simple financial review of the cost and performance of the project was done to provide a comparison between all the system being considered. Given the project complexity and system operation impacts, undertaking a more comprehensive analysis at this time was not deemed valid.

We did not investigate the impact of labor- and maintenance cost, cost of money and other related factors, since they were beyond the scope of this feasibility study. However, the simple comparison of cost vs. performance is a valid exercise to evaluate economic feasibility of various system configurations.

11.1 Fuel savings

The fuel savings from the wind farm, for both reduced diesel fuel consumption and the reduction in heat fuel via electrical resistance heating, is shown in Figure 36.

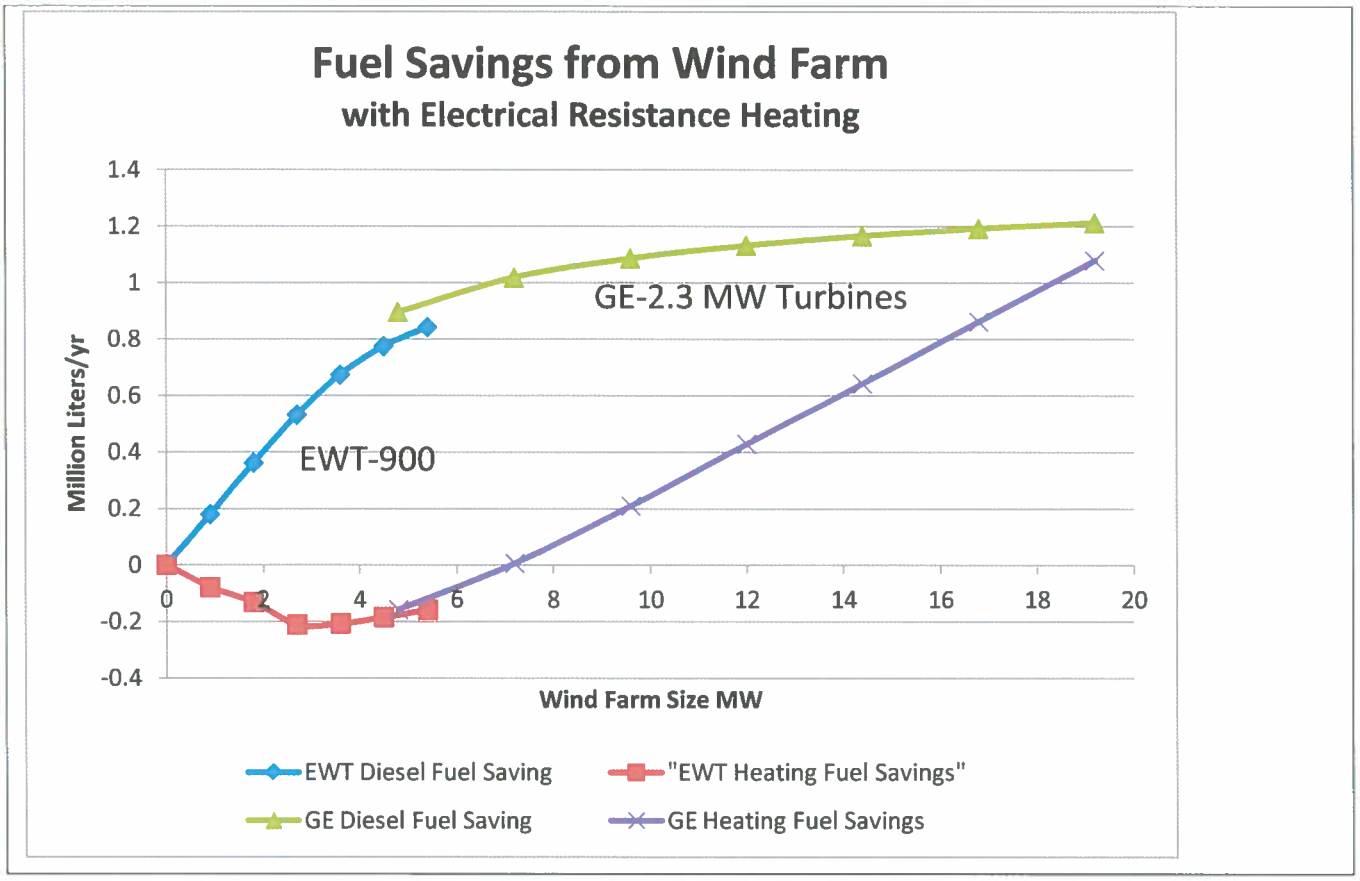


Figure 36: Fuel savings by wind farm size (Electrical Resistance Heating and two diesels always on)

This figure shows the fuel savings from both electrical and thermal uses of wind energy. No heat pumps, but only electrical resistance heating was assumed for dispatchable secondary loads. The loss of heating due to lower diesel generation IS accounted for in this figure

Additional fuel savings are evident when the system configuration is chanted to allow Diesel OFF operation and where 75% of the dispatchable thermal energy is generated by heat pumps. The total fuel savings significantly increase with larger wind farms exceeding 4 million gallons per year.

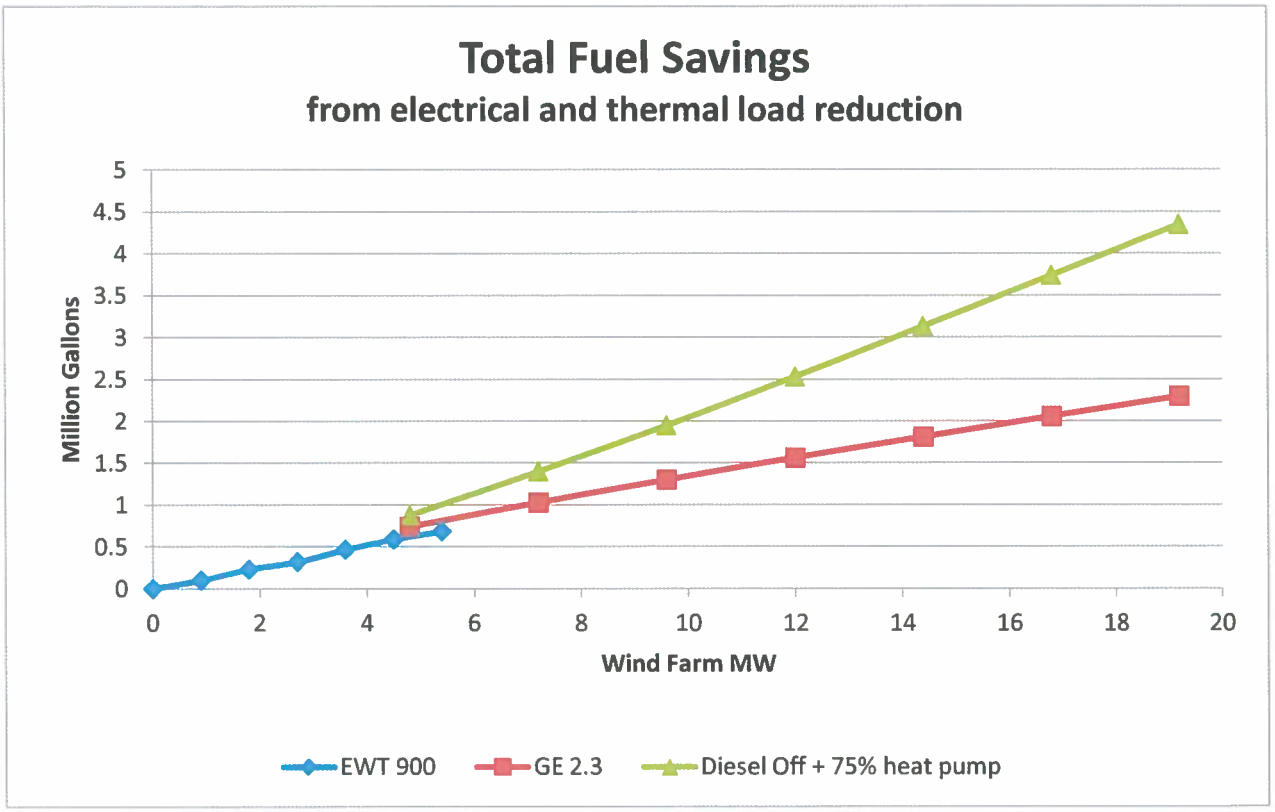


Figure 37: Combined fuel savings from heating- and diesel fuel

Bethel Wind Feasibility Summary

			Installed Cost			Fuel Savings		
Pene-tration, Case	Wind Turbine mfg.	Wind power	Turbine turn-key	Ancillary	Total Project	Electrical	Thermal	Total
-	-	MW	M$	M$	M$	M gal	M gal	M gal
Low	EWT	0.9	$4.00	$0.75	$4.70	0.18	-0.44	0.18
	EWT	1.8	$8.00	$0.75	$8.70	0.36	-0.11	0.36
	EWT	2.7	$11.60	$0.75	$12.40	0.53	-0.16	0.53
Medium	EWT	3.6	$15.00	$1.75	$16.80	0.67	-0.18	0.67
	EWT	4.5	$18.00	$2.15	$20.10	0.77	-0.18	0.77
	EWT	5.4	$20.60	$2.17	$22.80	0.84	-0.15	0.84
High, resistive load	GE	7.2	$18.90	$7.30	$23.10	1.02	0.01	1.02
	GE	9.6	$24.40	$7.80	$26.20	1.09	0.21	1.3
	GE	12	$29.30	$8.30	$29.30	1.13	0.43	1.56
	GE	14.4	$33.50	$8.90	$32.60	1.17	0.64	1.81
	GE	16.8	$37.80	$9.90	$35.40	1.19	0.86	2.05
	GE	19.2	$42.60	$11.60	$40.90	1.21	1.08	2.29
High, heat pumps	GE	7.2	$18.90	$8.30	$27.20	1.02	0.47	1.49
	GE	9.6	$24.40	$10.40	$34.80	1.09	0.81	1.89
	GE	12	$29.30	$13.00	$42.30	1.13	1.16	2.29
	GE	14.4	$33.50	$14.40	$47.90	1.17	1.52	2.69
	GE	16.8	$37.80	$15.90	$53.70	1.19	1.89	3.08
	GE	19.2	$42.60	$17.10	$59.70	1.21	2.25	3.46
High, Diesel-off, heat pumps	GE	7.2	$18.90	$8.80	$27.70	1.37	0.03	1.4
	GE	9.6	$24.40	$10.90	$35.30	1.66	0.28	1.95
	GE	12	$29.30	$13.50	$42.80	1.85	0.68	2.53
	GE	14.4	$33.50	$14.90	$48.40	1.96	1.17	3.13
	GE	16.8	$37.80	$16.40	$54.20	2.05	1.69	3.74
	GE	19.2	$42.60	$17.60	$60.20	2.12	2.23	4.35

Table 10: Wind farm cost and savings

11.2 Simple Payback

The simplest and least sophisticated way to compare system economics, is Simple Payback (Project Cost divided by Annual Savings). This metric is only valuable for gross comparisons and very simple comparisons of system performance. However, for initial screening, is does provide some insight.

No deductions for unused diesel engine waste heat were made in the Low and Medium Penetration configurations.

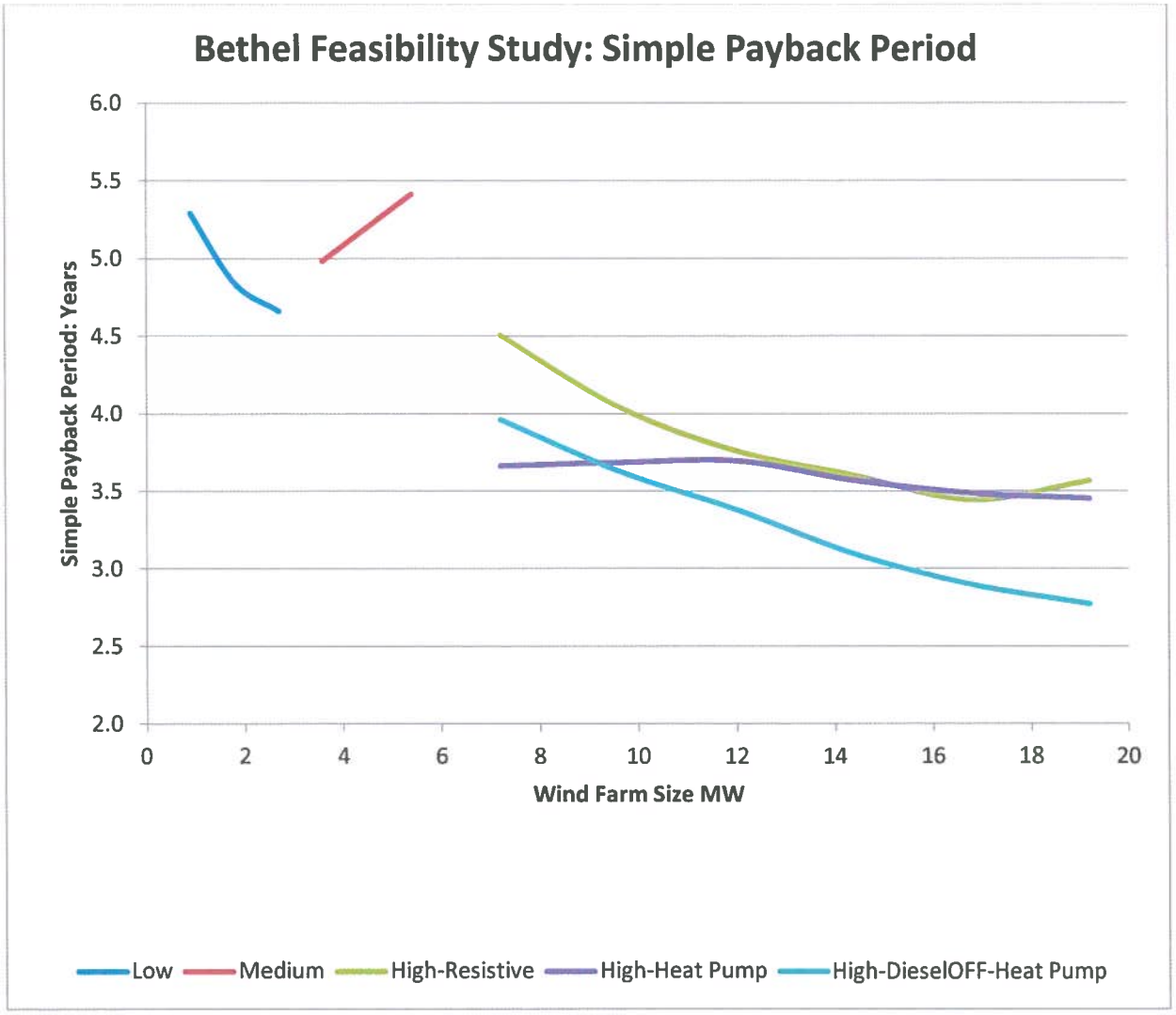


Figure 38: Simple pay-back period by wind farm size

The complete Simple Payback summary chart is presented in the next Figure.

Bethel Wind Feasibility: Simple Payback

	Turbine		Total Project	Fuel Savings at $5/gal	Simple Pay-Back
	-	MW	M$	M$	years
Low	EWT	0.9	$4.70	$0.90	5.3
	EWT	1.8	$8.70	$1.81	4.8
	EWT	2.7	$12.40	$2.66	4.7
Medium	EWT	3.6	$16.80	$3.37	5
	EWT	4.5	$20.10	$3.87	5.2
	EWT	5.4	$22.80	$4.21	5.4
High, resistive heaters	GE	7.2	$23.10	$5.12	4.5
	GE	9.6	$26.20	$6.48	4
	GE	12	$29.30	$7.80	3.8
	GE	14.4	$32.60	$9.04	3.6
	GE	16.8	$35.40	$10.27	3.4
	GE	19.2	$40.90	$11.46	3.6
High, heat pumps	GE	7.2	$27.20	$7.43	3.7
	GE	9.6	$34.80	$9.46	3.7
	GE	12	$42.30	$11.44	3.7
	GE	14.4	$47.90	$13.43	3.6
	GE	16.8	$53.70	$15.40	3.5
	GE	19.2	$59.70	$17.31	3.5
High, Diesel OFF, heat pumps	GE	7.2	$27.70	$7.00	4
	GE	9.6	$35.30	$9.74	3.6
	GE	12	$42.80	$12.65	3.4
	GE	14.4	$48.40	$15.66	3.1
	GE	16.8	$54.20	$18.70	2.9
	GE	19.2	$60.20	$21.73	2.8

Table 11: Simple pay-back

There are a number of interesting trends to note:

1) As the wind farm size grows into the Medium range, the project costs grow faster than the savings due to added complexity and infrastructure costs. This is sometimes referred to as the "Valley of Death" (Low point in economic returns).

2) As wind farms increase beyond the "Valley of Death", the saving increase at a significantly higher rate than the costs.

3) The Highest Penetration systems, in all configurations, have the highest potential savings, the highest value to the local residents (due to lowest cost, most stable and secure energy sources for both heat and electricity), the highest environmental values and the highest job creation potential.

APPENDIX A2.
Wind Resource Assessment for Bethel

ALASKA ENERGY AUTHORITY
813 W. Northern Lights Blvd.
Anchorage, AK 99503
Phone: 907-269-3000
Fax: 907-269-3044
www.akenergyauthority.org

Wind Resource Assessment for BETHEL, ALASKA

Date last modified: 2/21/2006
Compiled by: Mia Devine

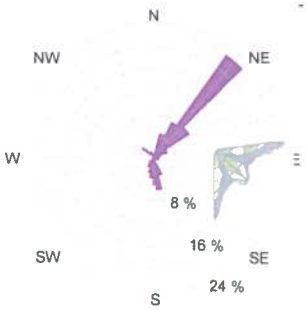
SITE SUMMARY

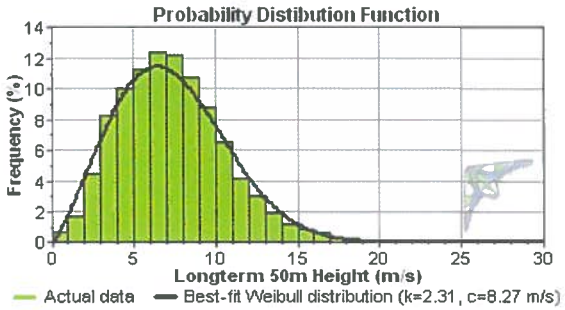
Site #:	5334
Latitude (NAD27):	60° 47' 8" N
	N 60.7856
Longitude (NAD27):	161° 53' 6" W
	W 161.885
Magnetic Declination:	14° 59' East
Tower Type:	50-meter NRG Tall Tower
Sensor Heights:	30m, 40m, 50m
Elevation:	42.3 meters (128 ft)
Monitor Start:	12/9/2004 18:00
Monitor End:	2/12/2006 11:00

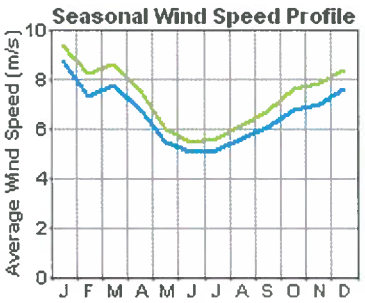
In December 2004, a 50-meter meteorological tower was installed on high ground west of the Bethel airport. The purpose of this monitoring effort is to evaluate the feasibility of utilizing utility-scale wind energy in the community. The measured wind speed and direction data at the site was compared to long-term trends in the area and estimates were calculated for the potential energy production from various types of wind turbines.

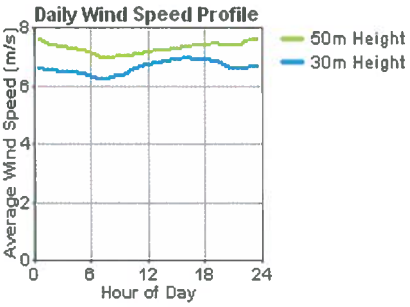
WIND RESOURCE SUMMARY

Annual Average Wind Speed (50m height):	7.3 m/s (16.3 mph)
Annual Average Wind Speed (30m height):	6.7 m/s (15.0 mph)
Average Wind Power Density (50m height):	440 W/m^2
Average Wind Power Density (30m height):	345 W/m^2
Wind Power Class (range = 1 to 7):	Class 4
Rating (Poor, Marginal, Fair, Good, Excellent, Outstanding):	Good
Prevailing Wind Direction:	Northeast









INTRODUCTION

Previous wind monitoring efforts have been conducted in the Bethel area with less than favorable results. The equipment used in those studies was mounted on 20-meter towers and were located adjacent to the buildings that would be served by a wind turbine. The Alaska Energy Authority (AEA) felt that the close proximity to buildings and the low elevation of the sites resulted in a wind resource that was not representative of the area and that winds suitable for a utility-scale wind project could be found a short distance outside of town. In December 2004, AEA, V3Energy, and local residents installed a 50-meter meteorological tower (leased from Chugach Electric) on private land west of town. This location is more likely to be representative of Bethel's best wind resource area and was recommended by wind siting meteorologist John Wade. The purpose of this monitoring effort is to evaluate the feasibility of utilizing utility-scale wind energy in the community. This report summarizes the wind resource data collected and the long-term energy production potential of the site.

SITE DESCRIPTION

Bethel is located near the mouth of the Kuskokwim River, about 40 miles inland from the Bering Sea and 400 air miles west of Anchorage. Figure 1 shows the location of the met tower relative to the surrounding terrain. The met tower is located on a ridge at slightly higher elevation than the town site.

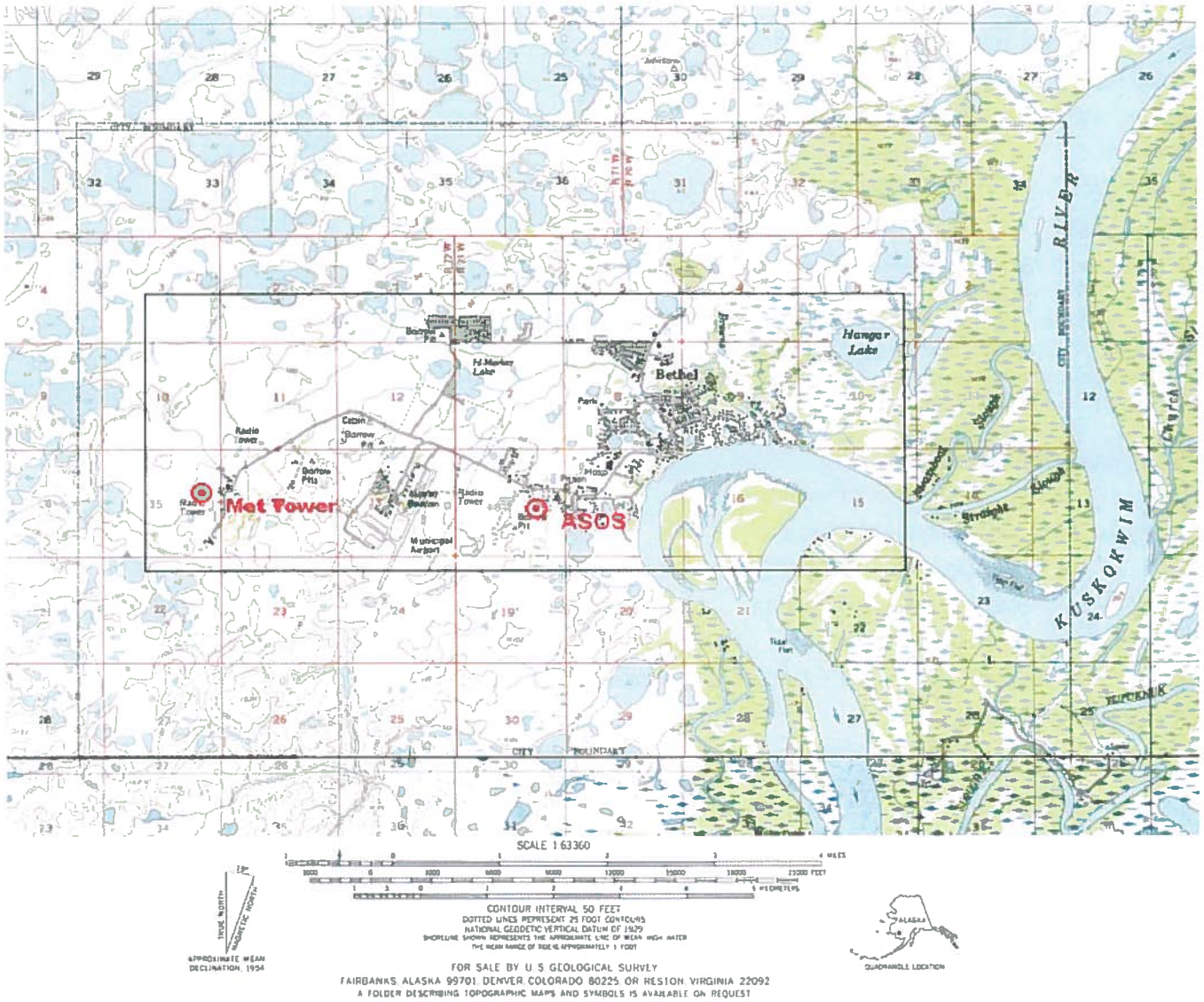


Figure 1. Topographic Map of Met Tower Site and Surrounding Area

The photos below illustrate the surrounding ground cover and any major obstructions, which could affect how the wind flows over the terrain from a particular direction. As shown, the landscape surrounding the met tower site is free of obstructions and relatively flat.

NW North NE East

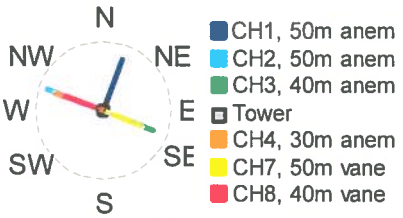
SE South SW West

Figure 2. Views Taken from Met Tower Base

Table 1 lists the types of sensors that were used, the channel of the data logger that each sensor was wired into, and where each sensor was mounted on the tower.

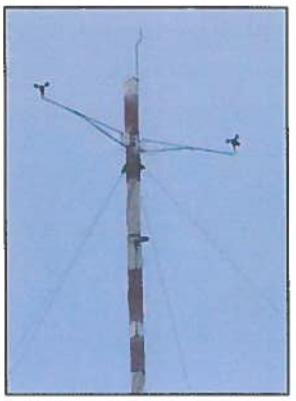
Table 1. Summary of Sensors Installed on the Met Tower

Ch #	Sensor Type	Height	Offset	Boom Orientation
1	#40 Anemometer	50 m	NRG Standard	20˚ True
2	#40 Anemometer	50 m	NRG Standard	290˚ True
3	#40 Anemometer	40 m	NRG Standard	110˚ True
4	#40 Anemometer	30 m	NRG Standard	280˚ True
7	#200P Wind Vane	50 m	290˚ True	110˚ True
8	#200P Wind Vane	40 m	110˚ True	290˚ True
9	#110S Temperature	4 m	NRG Standard	-



Aerial view of equipment on tower

DATA PROCESSING PROCEDURES AND DEFINITIONS



The following information summarizes the data processing procedures that were performed on the raw measured data in order to create an annual dataset of "typical" wind speeds, which could then be used to calculate potential power production from wind turbines. There are various methods and reasons for adjusting the raw data, so the purpose of these notes is to document what was done in this situation. The raw data set is available on the Alaska Energy Authority website (www.akenergyauthority.org) so one could perform their own data processing procedures. The processed data set is also available.

Units – Since most wind turbine specifications are provided in metric units, those units are used in this report.

1 meter/second = 2.24 mph = 1.95 knots
1 meter = 3.28 feet
1 °C = 5/9 (°F – 32)

Tower Shadow – The tower itself can affect readings from the anemometer at times when the anemometer is located downwind of the tower. To avoid this effect, two anemometers were placed at the top level so that neither would be in the wake of the tower at the same time. One data set is compiled from the 2 anemometers depending on the direction of the wind at any given time.

Icing – Anomalies in the data can suggest when the sensors were not recording accurately due to icing events. Since wind vanes tend to freeze before the anemometers, icing events are typically identified whenever the 10-minute standard deviation of the wind vane is zero (the wind vane is not moving) and the temperature is at or below freezing. Some additional time before and after the icing event are removed to account for the slow build up and shedding of ice on the sensors.

Filling Gaps – Whenever measured met tower data is available, it is used. Two different methods are used to fill in the remaining portion of the year. First, if nearby airport data is available, a linear correlation equation is defined between the airport and met tower site, and airport data is adjusted to fill the gap. If neither met tower nor airport data is available for a given timestep, the software program Windographer (www.mistaya.ca) is used. Windographer uses statistical methods based on patterns in the data surrounding the gap, and is good for filling short gaps in data.

Long-term Estimates – The year of data collected at the met tower site can be adjusted to account for inter-annual fluctuations in the wind resource. To do this, a nearby weather station with a consistent historical record of wind data and with a strong correlation to the met tower location is needed. If a suitable station is not available, there is a higher level of uncertainty in the wind speed that is measured being representative of a typical year.

Turbulence Intensity – Turbulence intensity is the most basic measure of the turbulence of the wind. Turbulence intensity is calculated at each 10-minute timestep by dividing the standard deviation of the wind speed during that timestep by the average wind speed over that timestep. It is calculated only when the mean wind speed is at least 4 m/s. Typically, a turbulence intensity of 0.10 or less is desired for minimal wear on wind turbine components.

Wind Shear – Typically, wind speeds increase with height above ground level. This vertical variation in wind speed is called wind shear and is influenced by surface roughness, surrounding terrain, and atmospheric stability. The met tower is equipped with anemometers at different heights so that the wind shear exponent, α, can be calculated according to the power law formula:

$$\left(\frac{H_1}{H_2}\right)^{\alpha} = \left(\frac{v_1}{v_2}\right)$$ where H_1 and H_2 are the heights and v_1 and v_2 are the measured wind speeds.

Wind shear is calculated only with wind speed data above 4 m/s. Values can range from 0.05 to 0.25, with a typical value of 0.14.

Scaling to Hub Height – If the wind turbine hub height is different from the height at which the wind resource is measured, the wind resource can be adjusted using the power law formula described above and using the wind shear data calculated at the site.

Air Density Adjustment – The power that can be extracted from the wind is directly related to the density of the air. Air density, ρ, is a function of temperature and pressure and is calculated for each 10-minute timestep according to the following equation (units for air density are kg/m^3):

$$\rho = \frac{P}{R \times T}$$

Where P is pressure (kPa), R is the gas constant for air (287.1 J/kgK), and T is temperature in Kelvin. Since air pressure is not measured at the met tower site, the site elevation is used to calculate an annual average air pressure value according to the following equation:

$$P = 1.225 - (1.194 \times 10^{-4}) \times \text{elevation}$$

Since wind turbine power curves are based on a standard air density of 1.225 kg/m3, the wind speeds measured at the met tower site are adjusted to create standard wind speed values that can be compared to the standard power curves. The adjustment is made according to the following formula:

$$V_{standard} = V_{measured} \times \left(\frac{\rho_{measured}}{\rho_{standard}} \right)^{\frac{1}{3}}$$

Wind Power Density – Wind power density provides a more accurate representation of a site's wind energy potential than the annual average wind speed because it includes how wind speeds are distributed around the average as well as the local air density. Units of wind power density are watts per square meter and represent the power produced per square meter of area that the blades sweep.

Wind Power Class – A seven level classification system based on wind power density is used to simplify the comparison of potential wind sites. Areas of Class 4 and higher are considered suitable for utility-scale wind power development.

Classes of Wind Power Density							
Class	10 m		30m		50m		Rating
	WPD (W/m^2)	Speed (m/s)	WPD (W/m^2)	Speed (m/s)	WPD (W/m^2)	Speed (m/s)	
1	<100	<4.4	<160	<5.1	<200	<5.6	Poor
2	100 - 150	4.4 - 5.1	160 - 240	5.1 - 5.8	200 - 300	5.6 - 6.4	Marginal
3	150 - 200	5.1 - 5.6	240 - 320	5.8 - 6.5	300 - 400	6.4 - 7.0	Fair
4	200 - 250	5.6 - 6.0	320 - 400	6.5 - 7.0	400 - 500	7.0 - 7.5	Good
5	250 - 300	6.0 - 6.4	400 - 480	7.0 - 7.4	500 - 600	7.5 - 8.0	Excellent
6	300 - 400	6.4 - 7.0	480 - 640	7.4 - 8.2	600 - 800	8.0 - 8.8	Outstanding
7	>400	>7.0	>640	>8.2	>800	>8.8	

Weibull Distribution – The Weibull distribution is commonly used to approximate the wind speed frequency distribution. The Weibull is defined as follows:

$$P(v) = \frac{k}{c}\left(\frac{v}{c}\right)^{k-1} \exp\left(\frac{-v}{c}\right)^{k}$$

Where P(v) is the probability of wind speed v occurring, c is the scale factor which is related to the average wind speed, and k is the shape factor which describes the distribution of the wind speeds. Typical k values range from 1.5 to 3.0, with lower k values resulting in higher average wind power densities.

LONG-TERM REFERENCE STATION

Wind data from the Bethel airport weather station, located 2.5 miles east of the met tower site, serves as a long-term reference for the wind resource in the area. Data is measured at a height of 10 meters above ground level and an elevation of 37.5 meters.

The National Weather Service upgraded the meteorological monitoring equipment at the Bethel airport to an Automated Surface Observing System (ASOS) on November 1, 1998. This new equipment, although more accurate, represents a discontinuity in the long-term wind speed record. Therefore, this report is based on measurements beginning January 1, 1999.

Figure 3. ASOS Equipment in Bethel

Hourly wind speed measurements from the Bethel airport weather station that are concurrent with recordings from the met tower site were purchased from the National Climatic Data Center. The correlation coefficient between these sites is 0.87 (a value of 1 is perfect). This suggests that, although the actual wind speed values at the two sites are different, the pattern of wind speed fluctuations is similar between the sites. Any historical patterns in the airport station data can also be applied to the met tower site with a high degree of certainty.

As shown in Table 2 and Figure 4, the area has a strong seasonal pattern, with greater wind speeds in the winter months than the summer months. The long-term annual average wind speed at the Bethel airport site is 5.2 m/s, which is fairly consistent, fluctuating up to 3% from year to year.

Table 2. Monthly Average Wind Speeds at Bethel Airport, 10-meter height (m/s)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave	% of Long-Term Ave
1999	7.0	4.5	5.8	5.6	4.7	4.0	4.9	4.3	4.7	4.4	5.5	5.7	5.1	99%
2000	6.6	5.0	5.3	5.0	4.3	4.0	4.4	5.2	4.6	4.7	6.2	6.4	5.2	100%
2001	5.4	5.8	6.2	5.9	5.2	4.7	4.5	4.6	4.3	5.0	5.0	5.2	5.2	100%
2002	6.5	6.1	5.2	6.5	4.8	4.2	4.0	4.3	5.3	5.6	5.3	4.7	5.2	101%
2003	6.3	5.5	7.0	5.5	4.5	4.5	4.9	4.1	4.4	4.8	5.3	4.9	5.2	100%
2004	6.3	6.2	5.2	4.6	4.7	4.3	3.8	4.2	4.2	5.6	6.2	5.8	5.1	98%
2005	7.4	5.2	5.7	5.0	4.6	4.1	4.3	4.8	5.9	4.5	6.3	6.0	5.3	103%
Ave	6.5	5.5	5.8	5.5	4.7	4.3	4.4	4.5	4.8	5.0	5.7	5.5	5.2	100%

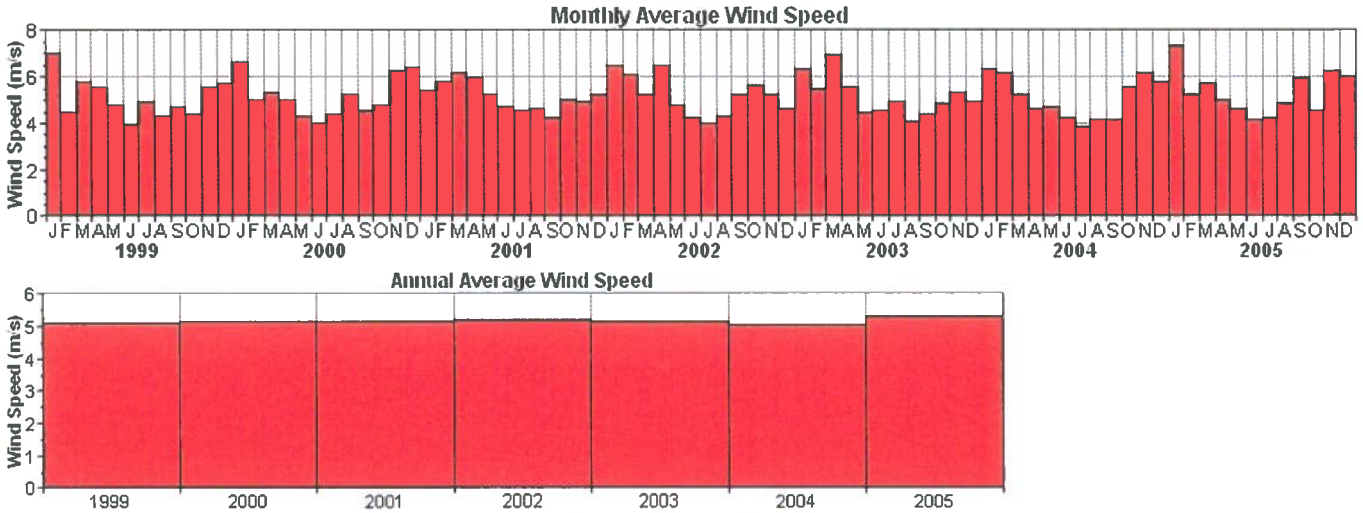


Figure 4. Monthly and Annual Average Wind Speeds at Bethel Airport, 10-meter height

According to the ASOS data, the average wind speed in the year 2005 was 3% greater than the long-term average. Therefore, the wind speed data recorded at the met tower site during the year 2005 was adjusted downwards by 3% to more accurately reflect what would be expected over the long term. Both measured and long-term data sets at the airport and met tower sites are shown in Figure 5.

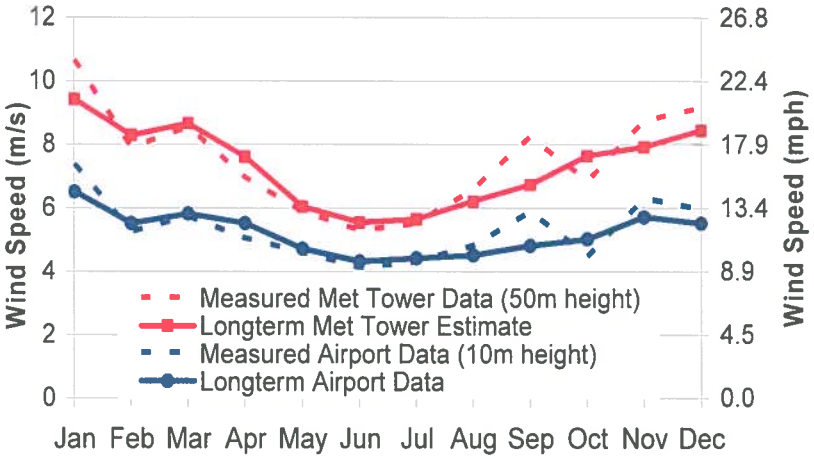


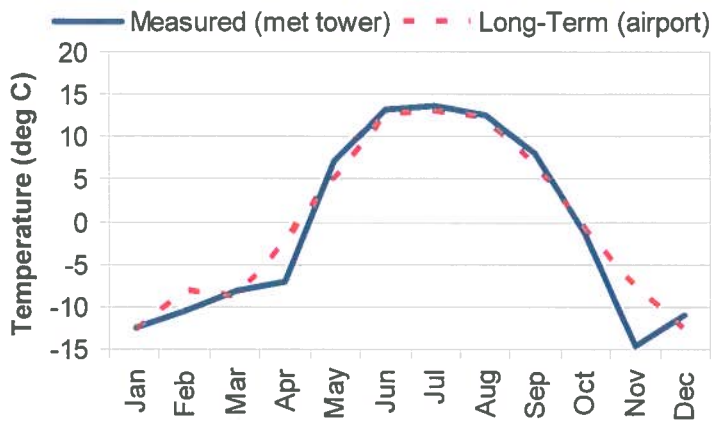
Figure 5. Measured Versus Long-Term Wind Speeds in Bethel

Extreme wind speeds recorded at the Bethel ASOS are summarized in Table 3. The fastest mile is defined as the speed of one mile of wind that passes the weather station and can be considered as the maximum sustained wind speed. The fastest mile recorded over a 41-year period was 27.7 m/s in February 1951. The peak gust over a 16-year period was 34.4 m/s in October 1992.

Table 3. Extreme Wind Speeds in Bethel, 10m height (source: Western Regional Climate Center)

	Airport Fastest Mile (1957-1998)			Airport Peak Gust (1982-1998)		
Month	m/s	mph	Year	m/s	mph	Year
Jan	24.1	54	1979	27.3	61	1993
Feb	27.7	62	1951	26.4	59	1988
Mar	21.9	49	1977	25.0	56	1991
Apr	19.7	44	1979	22.8	51	1995
May	18.3	41	1960	23.7	53	1985
Jun	19.2	43	1978	26.4	59	1980
Jul	17.9	40	1974	20.6	46	1982
Aug	20.6	46	1978	25.0	56	1994
Sep	24.6	55	1960	30.8	69	1982
Oct	23.2	52	1992	34.4	77	1992
Nov	26.8	60	1958	29.5	66	1990
Dec	25.9	58	1977	29.9	67	1982

The air temperature can affect wind power production in two primary ways: 1) colder temperatures lead to higher air densities and therefore more power production, and 2) some wind turbines shut down in very cold situations (usually around –25°C). The monthly average temperatures for Bethel are shown below. Typically, the temperature drops below -25°C during 2% of the year, or 185 hours per year.



Month	Measured (°C)	Long-Term (°C)
Jan	-12.4	-12.7
Feb	-10.4	-8.0
Mar	-8.2	-8.8
Apr	-7.0	-2.2
May	7.3	5.3
Jun	13.3	12.6
Jul	13.8	13.1
Aug	12.7	12.3
Sep	8.1	7.0
Oct	-1.2	-0.5
Nov	-14.6	-7.5
Dec	-10.8	-12.6
Ave	-0.8	-0.2

WIND DATA RESULTS FOR BETHEL MET TOWER SITE

Table 4 summarizes the amount of data that was successfully retrieved from the data logger at the met tower site. There was significant data loss during the winter months due to icing of the sensors, particularly in November, December and February. The airport ASOS data was used to fill these gaps where possible. The remaining gaps were filled with Windographer.

Table 4. Data Recovery Rate for Met Tower Anemometers

Month	Data Recovery Rate	Data Loss Due to Icing
January 2005	100%	11%
February 2005	100%	34%
March 2005	100%	8%
April 2005	100%	6%
May 2005	100%	2%
June 2005	100%	0%
July 2005	100%	0%
August 2005	100%	0%
September 2005	100%	0%
October 2005	100%	16%
November 2005	100%	31%
December 2005	100%	54%
Annual Average	100%	13%

Wind Speed Measurements

The wind resource was measured at various heights on the tower. Results from the 50-meter and 30-meter heights are summarized below. More details of the 50-meter level are shown in Table 6.

Table 5. Measured and Long-Term Average Monthly Wind Speeds at Met Tower Site

Wind Speeds (m/s)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave
50m Height, Measured	10.7	7.9	8.5	7.0	5.9	5.3	5.5	6.6	8.3	6.9	8.8	9.1	7.5
50m Height, Long-term	9.4	8.3	8.7	7.6	6.0	5.5	5.6	6.2	6.7	7.6	7.9	8.4	7.3
30m Height, Measured	10.0	7.0	7.7	6.2	5.4	4.9	5.1	6.1	7.5	6.1	7.8	8.3	6.9
30m Height, Long-term	8.8	7.4	7.8	6.8	5.5	5.1	5.2	5.7	6.1	6.8	7.0	7.6	6.7

The seasonal wind speed profile shows that the highest wind month is January and the lowest wind month is June. The daily wind speed profile shows that wind speeds are typically greater in the afternoon and evening hours and calmer in the morning.

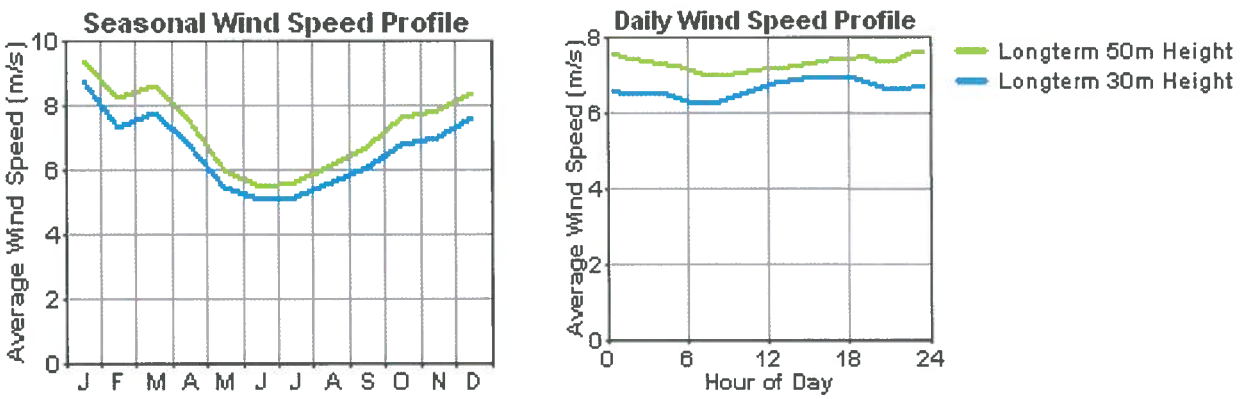


Figure 6. Seasonal and Diurnal Wind Speed Profile for Met Tower Site, Long-term Estimate

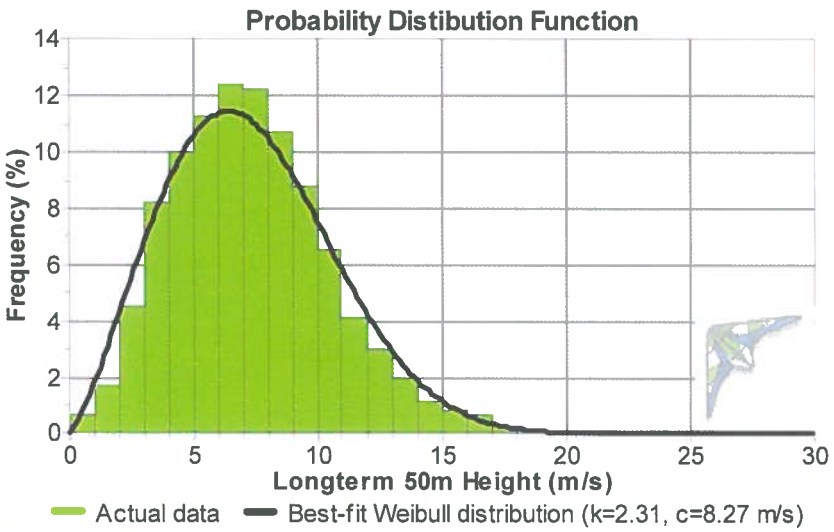
Table 6. Estimated Long-Term Wind Speeds at Met Tower Site, 50m Height (m/s)

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
0	9.6	8.5	8.8	8.1	6.4	6.0	6.8	6.4	6.8	7.8	8.1	8.4	7.6
1	9.4	8.5	8.7	8.0	6.3	6.0	6.4	6.2	6.5	7.8	7.9	8.3	7.5
2	9.5	8.4	8.6	8.0	6.0	5.9	5.9	6.0	6.4	7.8	7.7	8.8	7.4
3	9.5	8.2	8.4	8.0	6.0	5.8	5.8	5.9	6.5	7.8	7.8	8.7	7.4
4	9.5	8.5	8.7	7.9	6.0	5.6	5.6	5.8	6.5	7.5	7.8	8.5	7.3
5	9.3	8.4	8.8	8.1	5.9	5.4	5.3	6.0	6.5	7.4	7.7	8.3	7.3
6	9.1	8.2	8.7	7.9	5.7	5.0	5.2	5.8	6.4	7.4	7.9	8.3	7.1
7	9.3	8.0	8.7	7.9	5.2	4.7	4.8	5.6	6.3	7.6	7.9	8.3	7.0
8	9.3	8.2	8.6	7.5	5.0	4.7	4.8	5.6	6.3	7.9	7.9	8.5	7.0
9	9.2	8.5	8.7	7.1	5.1	4.8	5.1	5.8	6.3	7.7	8.1	8.4	7.1
10	9.3	8.1	8.9	6.7	5.6	5.0	5.0	6.1	6.7	7.4	8.3	8.2	7.1
11	9.4	8.1	8.8	6.5	5.8	5.2	5.1	6.4	6.9	7.4	8.3	8.1	7.2
12	9.3	8.2	8.8	6.7	5.9	5.3	5.3	6.4	6.9	7.6	8.1	8.2	7.2
13	9.3	8.4	8.6	7.0	6.0	5.3	5.2	6.6	7.2	7.4	7.8	8.2	7.3
14	9.3	8.4	8.4	7.1	6.1	5.3	5.3	6.7	7.3	7.5	7.7	8.7	7.3
15	9.6	8.3	8.7	7.3	6.1	5.4	5.7	6.7	7.0	7.6	7.7	8.3	7.4
16	9.6	8.2	8.7	7.3	6.4	5.6	6.0	6.6	7.0	7.3	7.8	8.3	7.4
17	9.7	8.3	8.6	7.6	6.7	5.7	5.8	6.6	6.9	7.3	7.8	8.3	7.4
18	9.5	8.3	8.3	7.7	6.5	6.0	6.0	6.6	6.8	7.5	8.0	8.7	7.5
19	9.5	8.4	8.5	7.9	6.2	6.0	6.1	6.3	6.7	7.6	8.1	8.7	7.5
20	9.3	8.1	8.8	8.0	6.3	6.0	5.7	5.9	6.7	7.7	7.9	8.4	7.4
21	9.3	8.0	8.8	8.2	6.6	5.9	5.7	6.1	6.7	7.9	7.9	8.3	7.4
22	9.6	8.1	8.8	8.1	6.6	6.0	6.0	6.4	6.8	8.2	7.9	8.7	7.6
23	9.4	8.2	8.6	8.2	6.4	6.2	6.4	6.3	7.0	8.0	8.1	8.6	7.6
Avg	9.4	8.3	8.7	7.6	6.0	5.5	5.6	6.2	6.7	7.6	7.9	8.4	7.3

The estimated long-term average wind speed is 7.3 m/s at a height of 50 meters above ground level.

Wind Frequency Distribution

A common method of displaying a year of wind data is a wind frequency distribution, which shows the percent of time that each wind speed occurs. Figure 7 shows the measured wind frequency distribution as well as the best matched Weibull distribution.



Bin m/s	Hrs/yr
0	60
1	151
2	396
3	722
4	880
5	989
6	1,086
7	1,073
8	942
9	772
10	572
11	365
12	262
13	170
14	103

Bin m/s	Hrs/yr
15	78
16	58
17	27
18	15
19	9
20	8
21	8
22	4
23	3
24	3
25	2
26	2
27	1
28	1
29	0
Total:	8,760

Figure 7. Wind Speed Frequency Distribution of Met Tower Data, 50-meter height

The cut-in wind speed of many wind turbines is 4 m/s and the cut-out wind speed is usually 25 m/s. The frequency distribution shows that a large percentage of the wind in Bethel is within this operational zone.

Wind Direction

Wind power roses show the percent of total power that is available in the wind by direction. The annual wind power rose for the met tower site is compared to the airport site in Figure 8. The met tower site is based on one year of data, while the airport site is based on seven years of data. The correlation coefficient between the sites is 0.97. The predominant wind direction at both locations is northeast.

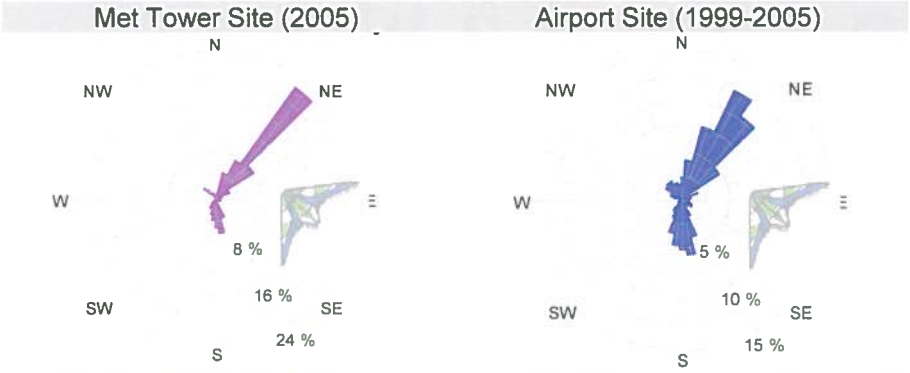


Figure 8. Annual Wind Power Roses for Met Tower Site and Airport Site

Monthly wind power roses for the met tower site are shown below. The strong winter winds come from the northeast, while the lighter summer winds tend to come from the south.

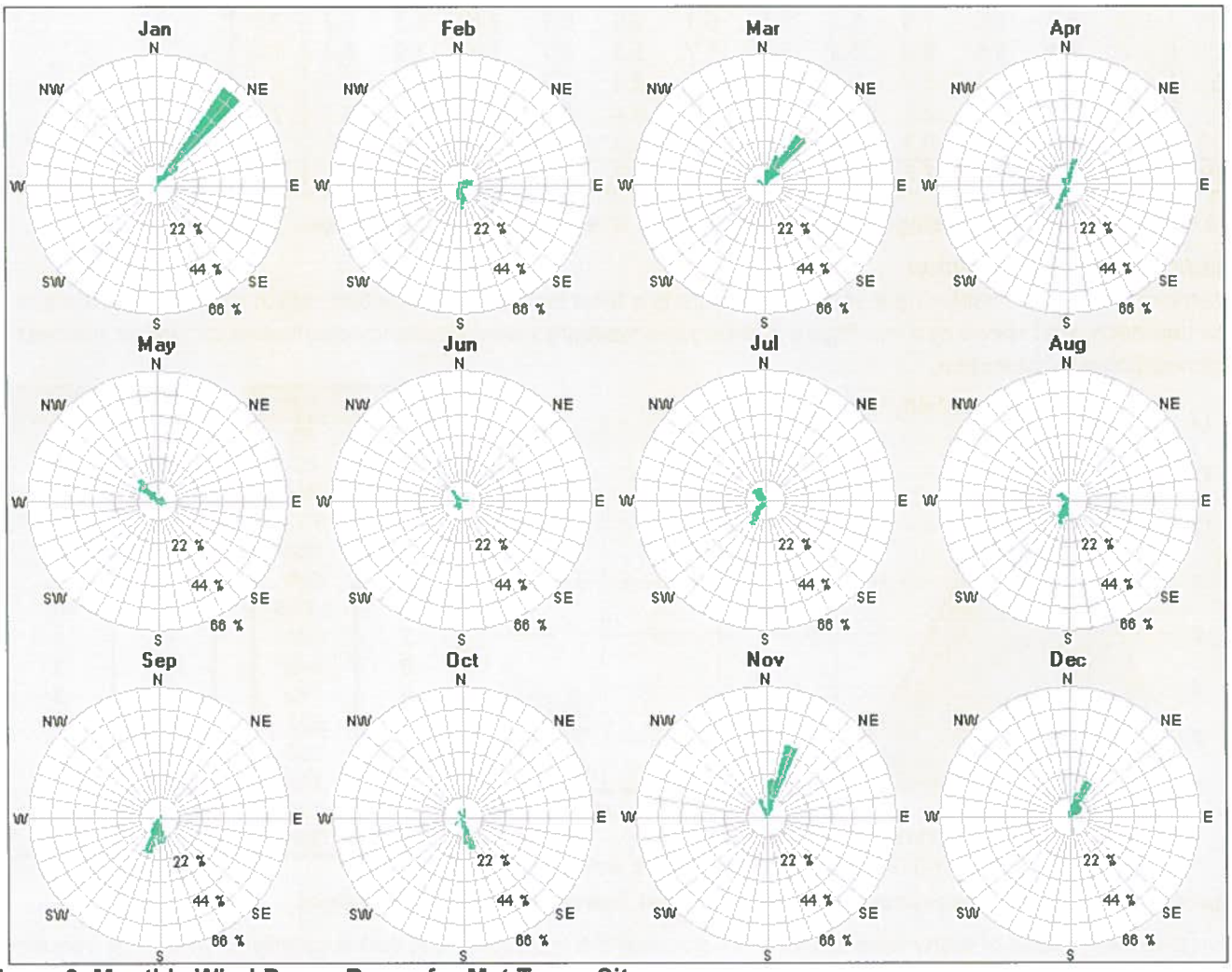
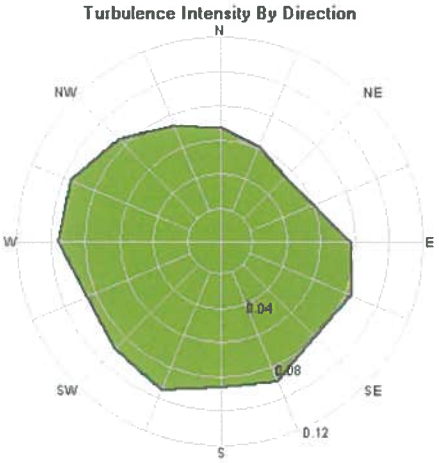


Figure 9. Monthly Wind Power Roses for Met Tower Site

Turbulence Intensity

Various turbulence intensity characteristics are shown in Figure 10. The turbulence intensity from all directions and for all months is low and unlikely to contribute to excessive wear of wind turbines.

Month	Turbulence Intensity
Jan	0.06
Feb	0.06
Mar	0.06
Apr	0.07
May	0.12
Jun	0.14
Jul	0.13
Aug	0.11
Sep	0.10
Oct	0.08
Nov	0.06
Dec	0.06
Ave	0.09



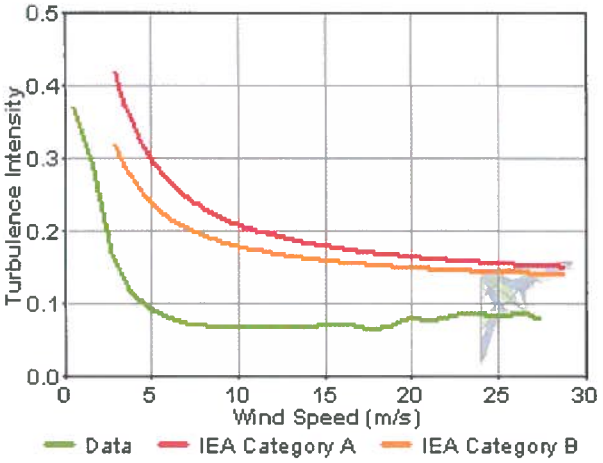


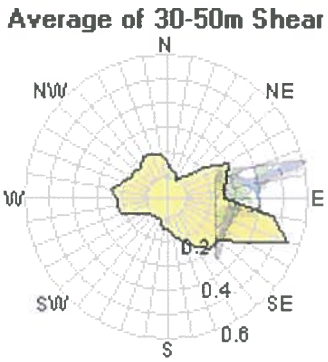
Figure 10. Turbulence Intensity Characteristics of Met Tower Site

Figure 10 plots the average turbulence intensity versus wind speed for the met tower site as well as for Category A and B turbulence sites as defined by the International Electrotechnical Commission Standard 61400-1, 2nd Edition. Category A represents a higher turbulence model than Category B. In this case, the met tower data is less turbulent than both categories across the whole range of wind speeds.

Wind Shear

Wind shear was calculated between the 50-meter anemometer and the 30-meter anemometer, and results are summarized in Figure 11.

Month	30m to 50m Wind Shear
Jan	0.11
Feb	0.26
Mar	0.23
Apr	0.23
May	0.18
Jun	0.17
Jul	0.16
Aug	0.19
Sep	0.18
Oct	0.23
Nov	0.18
Dec	0.23
Ave	0.19



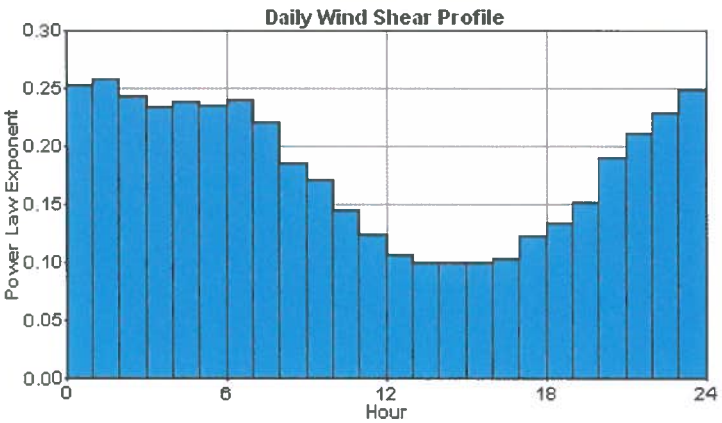


Figure 11. Wind Shear Characteristics of Met Tower Site

The average wind shear for the site is 0.19. As shown, the wind shear varies by month, direction of the wind, and time of day. These wind shear values can be used to adjust the wind resource data to heights other than those that were measured and reported here, as described previously in the Data Processing Procedures and Definitions section.

POTENTIAL POWER PRODUCTION FROM WIND TURBINES

Various wind turbines, listed in Table 7, were used to calculate the potential energy production at the met tower site based on the long-term wind resource data set. Although different wind turbines are offered with different tower heights, to be consistent it is assumed that any wind turbine rated at 100 kW or less would be mounted on a 30-meter tall tower, while anything larger would be mounted on a 50-meter tower. The wind resource was adjusted to these heights based on the measured wind shear at the site. The wind resource was also adjusted to standard air density.

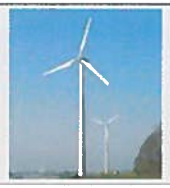
Results are shown in Table 7. Among the results is the gross capacity factor, which is defined as the actual amount of energy produced divided by the maximum amount of energy that could be produced if the wind turbine were to operate at rated power for the entire year. Inefficiencies such as transformer/line losses, turbine downtime, soiling of the blades, yaw losses, array losses, and extreme weather conditions can further reduce turbine output. The gross capacity factor is multiplied by 0.90 to account for these factors, resulting in the net capacity factor listed.

CONCLUSION

This report provides a summary of wind resource data collected from December 2004 through January 2006 in Bethel, Alaska. The data was compared to long-term trends in the area and, based on correlations with the Bethel airport weather station, estimates were made to create a long-term dataset for the Bethel met tower site. This information was used to make predictions as to the potential energy production from wind turbines at the site.

It is estimated that the long-term annual average wind speed at the site is 7.3 m/s at a height of 50 meters above ground level and 6.7 m/s at a height of 30 meters. Taking the local air density and wind speed distribution into account, the average wind power density for the site is 440 W/m^2. This information means that Bethel has a Class 4 wind resource, which is "good" for wind power development. The net capacity factor for large scale wind turbines would range from 21 – 36%.

Table 7. Power Production Analysis of Various Wind Turbine Models

Wind Turbine Options			N/A						
Manufacturer Information	Bergey 10 kW	Fuhrlander FL30 30 kW	Vestas V15* 65 kW	Entegrity 15/50 65 kW	Fuhrlander FL100 100 kW	Northern Power NW100 100 kW	Fuhrlander FL250 250 kW	Vestas V27* 225 kW	Vestas V47* 660 kW
Tower Height	30 meters	30 meters	30 meters	30 meters	50 meters	50 meters	50 meters	50 meters	50 meters
Swept Area	38.5 m^2	133 m^2	177 m^2	177 m^2	348 m^2	284 m^2	684 m^2	573 m^2	1,735 m^2
Weight (nacelle & rotor)	N/A	410 kg	N/A	2,420 kg	2,380 kg	7,086 kg	4,050 kg	N/A	N/A
Gross Energy Production (kWh/year)									
Jan	3,174	13,867	22,934	22,978	45,137	37,265	101,646	94,070	319,353
Feb	1,805	8,744	12,517	13,235	25,896	21,194	69,692	63,947	223,083
Mar	2,304	10,772	16,181	16,683	32,836	26,855	84,428	77,643	271,135
Apr	1,602	7,650	11,013	11,431	22,706	18,494	60,982	56,017	197,646
May	987	5,073	5,023	6,193	12,825	10,168	35,887	32,365	126,207
Jun	788	3,955	3,680	4,688	10,120	7,979	28,215	25,405	95,828
July	874	4,312	4,212	5,242	11,326	9,022	30,498	27,321	100,304
Aug	1,162	5,696	6,413	7,521	15,469	12,446	40,718	37,137	138,078
Sep	1,449	6,835	8,797	9,733	19,645	15,997	48,995	44,984	162,470
Oct	1,599	8,054	11,202	11,894	23,420	18,851	63,102	57,128	204,948
Nov	2,062	9,598	14,290	14,907	29,406	24,101	72,506	66,665	232,602
Dec	2,360	10,973	15,471	16,441	32,459	26,772	81,604	75,463	269,962
Annual	20,165	95,530	131,732	140,947	281,243	229,146	718,271	658,145	2,341,615
Annual Average Capacity Factor									
Gross CF	23%	36%	23%	24%	32%	26%	33%	33%	41%
Net CF	21%	33%	21%	22%	29%	24%	30%	30%	36%

Notes: The sizes of Vestas turbines listed are no longer available new. Remanufactured turbines are available from various suppliers.
Energy estimates are based on the wind resource measured at the met tower site, adjusted for long-term trends and local air density.

APPENDIX B.
AIRWAVE PROPAGATION NONINTERFERENCE

RF ELECTROMAGNETIC FIELD RE-RADIATION ANALYSIS

December 12, 2015

PREPARED FOR

CRW Engineering, LLC

By Broadcast Wind, LLC

And

Hatfield and Dawson, LLC

ANALYSIS OF WIND GENERATION FACILITY NEAR STATION KYUK-AM

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Executive Summary

The Alaska Village Electric Cooperative (AVEC) serving the town of Bethel, Alaska is contemplating the placement of a EWT Directwind 54-900 wind turbine with a blade diameter of 54 meters and a hub height of 50 meters. The turbine is to be located at Latitude 60°46'59.19"N and Longitude 161°53'6.04"W approximately 35 degrees northeast and 77 meters distance from class A - AM radio station KYUK's non-directional antenna facility transmitting at a frequency of 640 kHz and a power of 10,000 watts (Day and Night). The radio station is licensed to Bethel Broadcasting, Inc.

CRW Engineering Group, LLC is a full service engineering and surveying firm, based in Anchorage Alaska and is serving as AVEC's project manager for development of the Bethel wind site. In November 2015, CRW contracted with Broadcast Wind, LLC to help determine whether the proposed turbine siting would cause unacceptable interference to KYUK's AM signal.

Broadcast Wind is a New Jersey engineering consulting company founded in 2010 by broadcast industry veterans to provide RF interference analysis for the wind and broadcasting industries and to help establish the standards needed to ensure non-interference of turbine blades with RF signals. Clients include US broadcast station groups, the United States Department of Agriculture, Northland Power LLC, Exelon, NextEra Energy Resources LLC, and Invenergy LLC.

An AM broadcast station near a wind turbine induces radio frequency current in the turbine's mast, which in turn re-radiates a signal that has the potential to perturb the radiation pattern of the broadcast signal. An AM station near a wind turbine also has the potential to create safety hazards to personnel during construction. Voltages induced between the mast and construction equipment can create dangerous electrical arcs. To determine the level of signal perturbation and whether there is a safety hazard, Broadcast Wind engaged its associates at AM radio specialist Hatfield and Dawson (H&D) of Seattle, Washington to model the site.

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Hatfield & Dawson is a Washington State engineering consulting firm with a specialized practice in electromagnetic analysis of AM and FM broadcasting antenna systems, field strength measurement and hazard analysis. The firm has been in operation in its present form since 1973 and is the successor to the firm of James B. Hatfield (Sr.), established in 1945.

The resulting analysis has two major conclusions:

1) The predicted change in the circularity of the KYUK antenna pattern is within FCC guidelines. Detuning the turbine structure to compensate for antenna pattern perturbation will not be required.

2) There is a risk of electrical arcing during construction. When construction equipment, especially cranes, are brought into contact with the wind turbine mast a conducting loop will be formed in which voltage induced from station KYUK's transmitter can produce dangerous electrical arcs. The sensitivity to arcing will depend on the type of crane, soil resistivity (which varies with weather conditions), and orientation of the crane relative to the turbine's mast and the AM broadcast transmitter. A safety analysis based on these variables would be needed to specify the arc risks for the proposed EWT Directwind turbine and steps needed to prevent them.

INTRODUCTION

Broadcast Wind, LLC engaged H&D to evaluate the radiofrequency (RF) effects of the proposed construction of a EWT Directwind 54-900 wind turbine with a blade diameter of 54 meters and a hub height of 50 meters. The turbine is to be located at Latitude 60°46'59.19"N and Longitude 161°53'6.04"W approximately 35 degrees northeast and 77 meters distance from a class A - AM radio station - KYUK. This report will examine the effect of the new wind turbine on the operation of KYUK.

DESCRIPTION OF NEARBY AM BROADCAST STATION

Bethel Broadcasting, Inc. is the licensee and operator of AM broadcast station KYUK. KYUK operates on a frequency of 640 kHz with a daytime & nighttime power of 10,000 Watts, utilizing a non-directional antenna system. The signal broadcast from the antenna system serves Bethel and large areas of southwestern Alaska.

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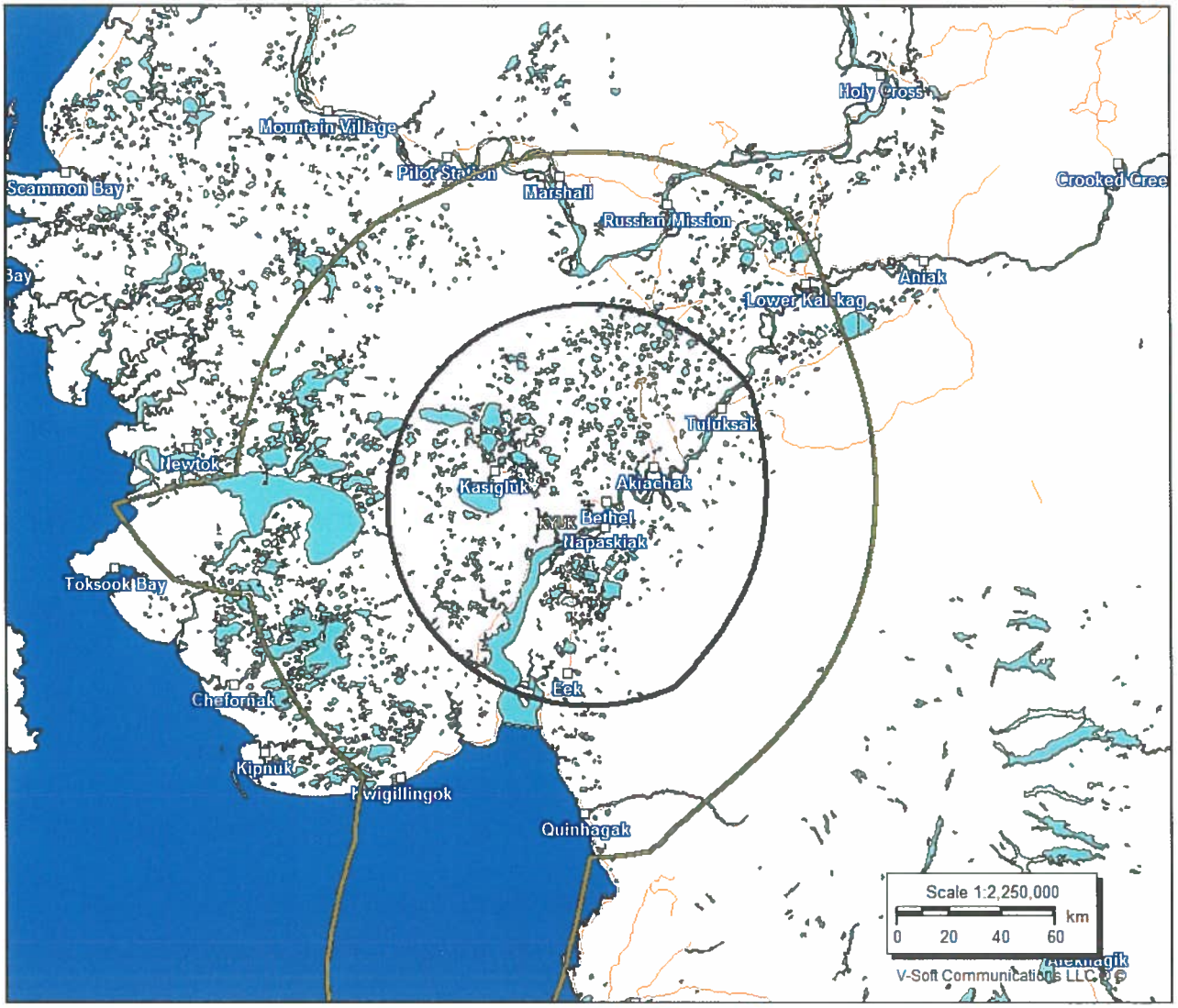

2.0 & 0.5 mV/m Coverage from KYUK

The licensed transmitter site (shown below) for KYUK-AM is located on the west side of Bethel (red circle). The proposed wind turbine (small yellow circle) is 77 meters from the KYUK tower (red dot). The wind turbine will be 50 meters tall at the hub, with an additional 27 meters of height to the top of the blade when the blades are in the inverted "Y" position.

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Aerial photograph of Bethel, Alaska

Aerial photograph of KYUK Site

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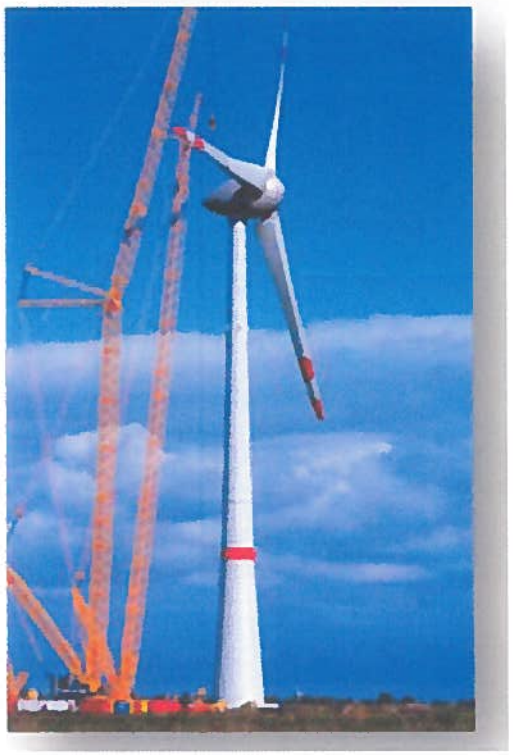
RADIO FREQUENCY FIELDS AND CONSTRUCTION CRANES



The KYUK transmitting system produces a radio signal with a power of 10 kW. The KYUK site is close enough to the proposed wind turbine site to pose a significant problem to the operation of construction cranes which would be used for installation of the wind turbine.

In the simplest terms, a crane, particularly if oriented in a line toward the AM transmitting antenna, becomes an efficient receiving antenna for the radio frequency energy. The radio station produces a strong electromagnetic field and the wire loop formed by the crane boom and cable receives the field and therefore creates an RF voltage (Alternating Current - 640 kHz - not 60 Hz). This is very much the same as the generation of electrical current with the application of Faraday's Law of Induction. That is to say, when a radio signal is intercepted by a loop of wire (in this case, the crane) an electrical current is induced in the wire and therefore a voltage is generated between the hook and ground. The fact that one end of the crane is grounded does not eliminate the voltage induced on the wire. The ability of the crane to act as an antenna is related to distance from the radio antenna, the effective size of the loop produced by the length of the boom, the length of cable, and the orientation of the loop or loops of the crane's rigging to the RF field.

When this current is induced on the loop of the crane, an RF voltage is present on the crane hook. When the hook comes in contact with a grounded electrical conductor the circuit is complete. The human body will conduct RF current, and if this current is large or concentrated it will produce RF burns. Reducing the level of the current density will allow the current to flow without causing burns. The risk of RF burns is a very significant safety problem when working with cranes near an AM station. RF burns are unpleasant but do not present a risk of electrocution. However, they can startle a worker at a nearby construction site and present a fall hazard. See video of crane hook RF voltage from a nearby AM radio station here: http://www.youtube.com/watch?v=iiirMEdiJQI&feature=plcp&context=C3145d56UDOEgsToPDskIrBDFS6gKJt2QimZehRcSn.

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If the crane hook comes into contact with a ground or a grounded object such as a part of the wind turbine equipment, an electrical arc will be produced. This, of course, is not acceptable around combustible materials because the electrical arc can be a source of ignition.

To determine the magnitude of this problem we will need to produce a moment method model that is specific to the types of cranes that will be used at this site. From the information we learn from this modeling we can outline a mitigation process to minimize the risk to personnel and equipment. We can then provide safety education and training to personnel so that they fully understand this problem.

MODELING BACKGROUND

Broadcast Wind has engaged H&D to evaluate the impact of the wind turbine facility on the antenna pattern of KYUK (AM). Method of Moments ("MoM") computer modeling has been used to determine the effects of the turbine on the AM station's operation.

H&D has developed a model of the KYUK(AM) antenna system that is capable of replicating the FCC-specified as-built licensed antenna pattern, which in this case is omnidirectional both daytime and nighttime. With the model of the antenna system accurately replicating the FCC licensed antenna pattern, the wind turbine can then be added to the model to determine its impact on KYUK.

MODELING CRITERIA

MoM modeling programs commonly in use in the Medium Frequency (MF) band utilize numerical approximations to model the effects of cylindrical wires and surface patches in the presence of external electromagnetic fields or applied voltage sources. In order for the approximations used in these programs to produce accurate results certain criteria on the geometry and electrical characteristics of the elements used in the model must be maintained. Some of these criteria are derived directly from the numerical methods used to model real-world effects, and others have been determined through empirical testing and have been widely accepted as best practices in the modeling community. A summary of the criteria that should be employed when modeling the KYUK antenna array and the proposed wind turbine is outlined below.

1. The system models of the antennas, wind turbines and high voltage transmission lines must not violate any of the constraints of the computer program being used.

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2. All modeled structures, the ground plane, and all connections between the modeled structures and the ground plane will be assumed to be lossless; with the exception that antenna base resistance may be employed when modeling the KYUK antenna to achieve a modeled efficiency that is equivalent to the FCC specified pattern efficiency.

3. Structures that are not cylinders but that otherwise have uniform cross section, may be modeled as a cylinder with a radius equivalent to the radius of a circle having the same circumference as the physical structure being modeled.

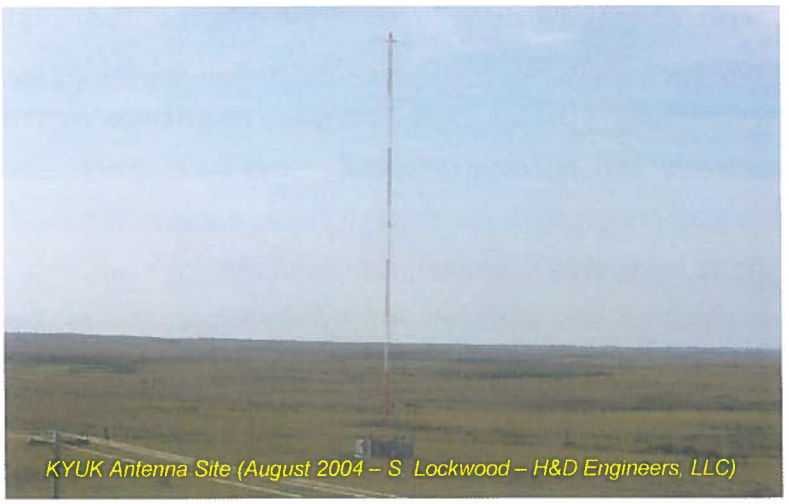
4. For vertical structures whose cross section tapers with height, the structure may be modeled using multiple wires having stepped radii that simulate the taper of the physical structure being modeled.

5. No wire segment in the model may exceed 10 electrical degrees in length at the KYUK operating frequency of 640 kHz.

6. The model of each wind turbine should include the vertical support structure and any conducting elements in the blades such as grounded lightning protection cables or rods. A worst-case blade rotation angle should be determined through modeling and this orientation should be used for all wind turbine models.

MODELING BACKGROUND AND CRITERIA AS IMPLEMENTED

A model of the KYUK (AM) antenna system, and the proposed turbine structure, was developed using a MoM electromagnetic modeling program. These MoM programs are based on the Numerical Electromagnetics Code (NEC) algorithms written by J. Burke and A. Poggio in 1981 at Lawrence-Livermore Labs under contract to the U.S. Navy. These algorithms simulate the electromagnetic response of antennas and metal structures. For this model we have used *Expert MININEC Broadcast Professional*, Version 14.0, authored by J.W. Rockway and J.C. Logan published by EM Scientific, Inc.


KYUK Antenna Site (August 2004 – S. Lockwood – H&D Engineers, LLC)

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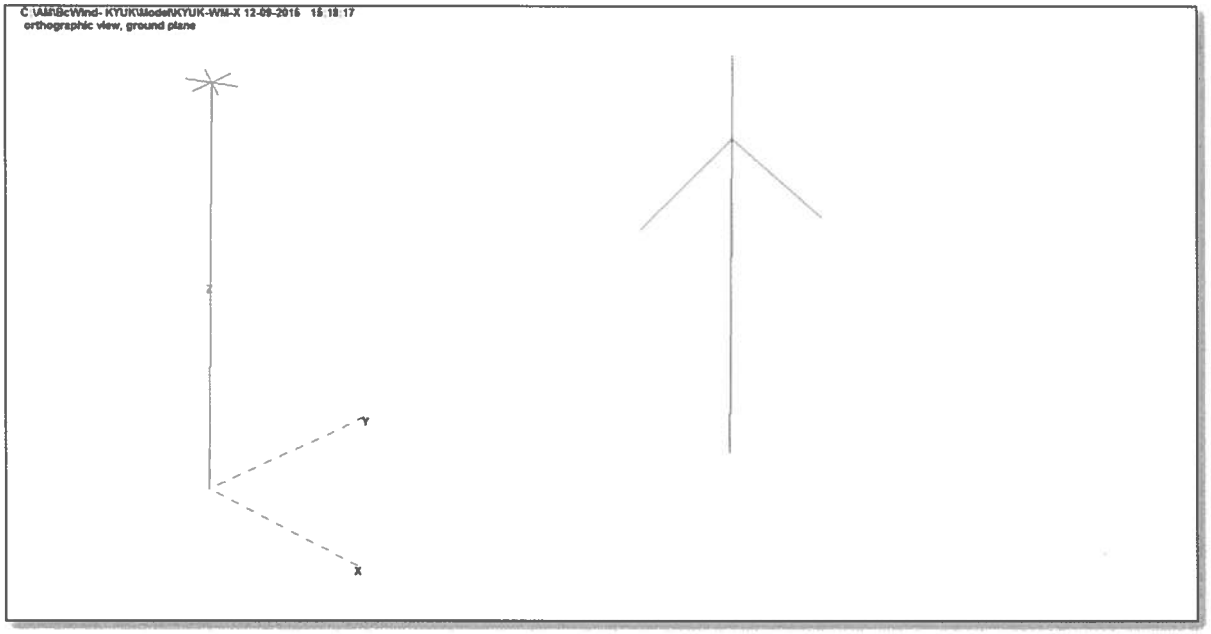
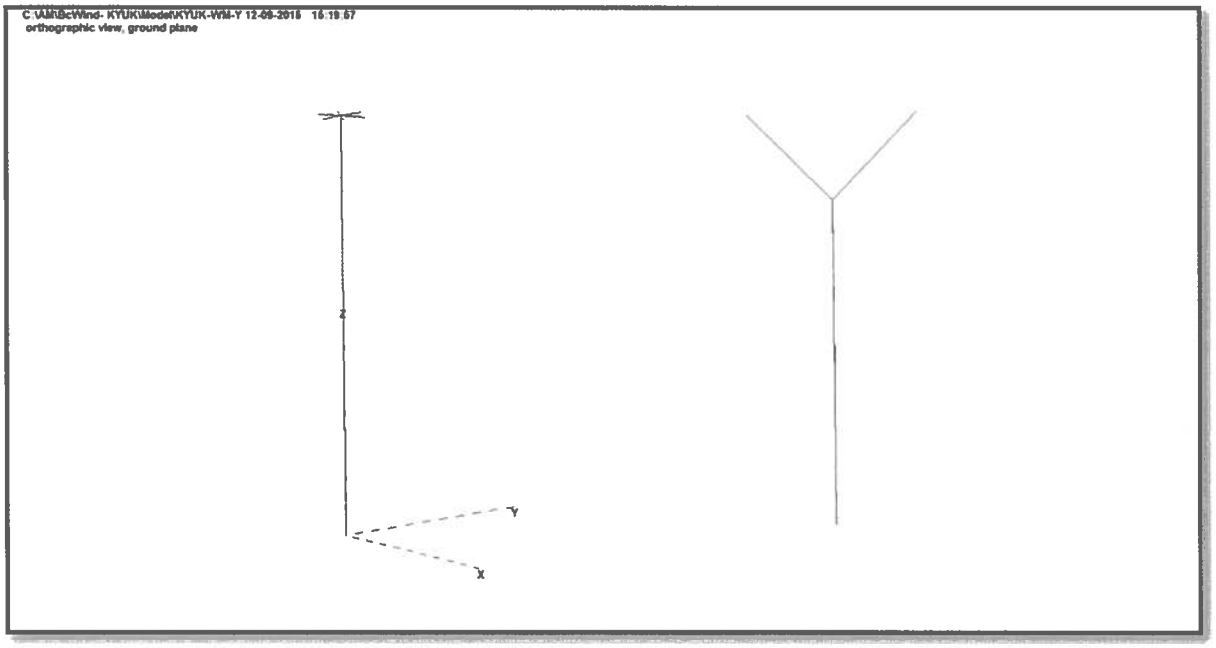


MODEL OF KYUK WITH TURBINE IN INVERTED "Y" POSITION



MODEL OF KYUK WITH TURBINE IN "Y" POSITION

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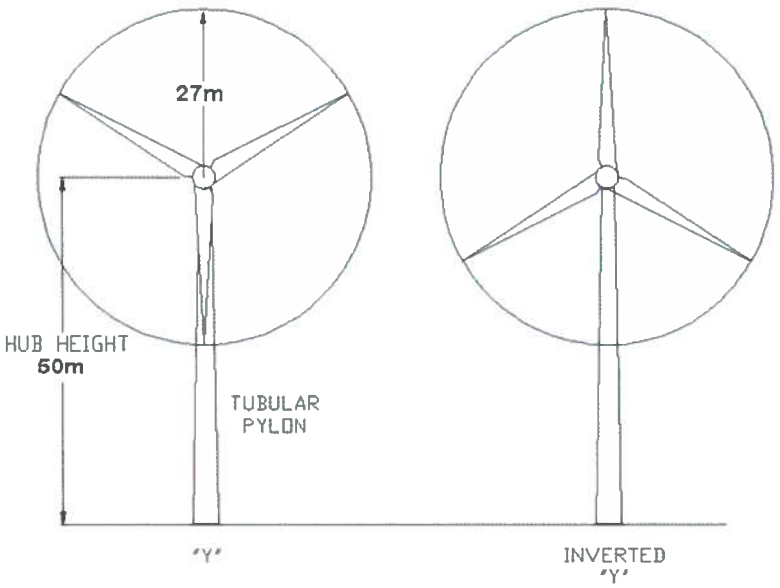
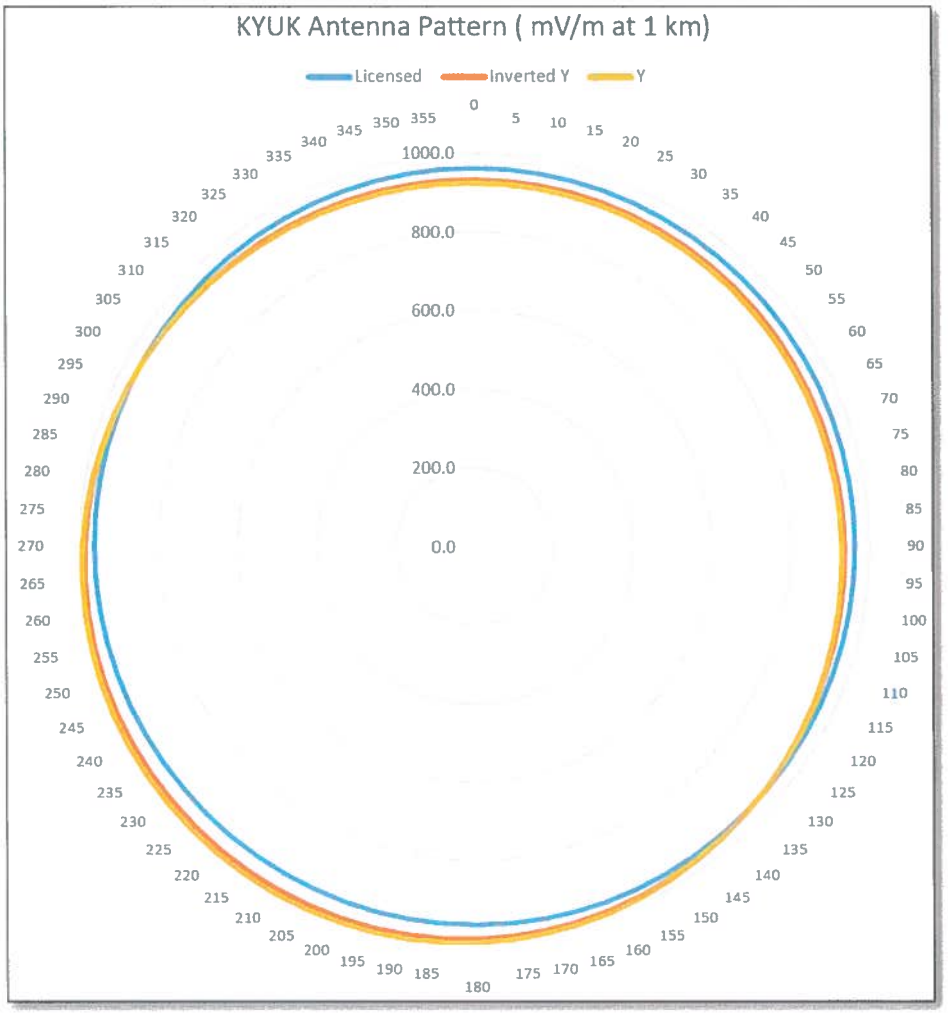
The model of the KYUK antenna array has 14 segments, 7 segments for the tower and 8 segments for the "wagon wheel" top-loading. The model of an individual wind turbine structure has 19 segments. It includes the vertical pylon support structure, the three turbine blades, and the grounded lightning protection cables in the blades and nacelle. Two blade rotation angles have been implemented to determine worst-case conditions: the "Y" position, and the inverted "Y" position shown above. Analysis indicates that it makes little difference whether the blade rotation angles are in the "Y" position, or the inverted "Y" position. Each orientation has about the same effect on the KYUK daytime and nighttime patterns.





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	KYUK Antenna Pattern (mV/m at 1 km)				
Azimuth	Licensed	Inverted Y	Invert Y Change in dB	Y	Y Change in dB
0	962.4	933.0	-0.3	924.3	-0.4
5	962.4	932.7	-0.3	923.9	-0.4
10	962.4	932.5	-0.3	923.6	-0.4
15	962.4	932.5	-0.3	923.5	-0.4
20	962.4	932.5	-0.3	923.5	-0.4
25	962.4	932.5	-0.3	923.5	-0.4
30	962.4	932.5	-0.3	923.5	-0.4
35	962.4	932.5	-0.3	923.6	-0.4
40	962.4	932.5	-0.3	923.5	-0.4
45	962.4	932.5	-0.3	923.5	-0.4
50	962.4	932.5	-0.3	923.5	-0.4
55	962.4	932.5	-0.3	923.5	-0.4
60	962.4	932.5	-0.3	923.6	-0.4
65	962.4	932.7	-0.3	923.9	-0.4
70	962.4	933.0	-0.3	924.3	-0.4
75	962.4	933.4	-0.3	925.0	-0.3
80	962.4	934.2	-0.3	926.0	-0.3
85	962.4	935.2	-0.2	927.3	-0.3
90	962.4	936.5	-0.2	929.1	-0.3
95	962.4	938.2	-0.2	931.4	-0.3
100	962.4	940.3	-0.2	934.1	-0.3
105	962.4	942.8	-0.2	937.4	-0.2
110	962.4	945.7	-0.2	941.1	-0.2
115	962.4	949.0	-0.1	945.3	-0.2
120	962.4	952.6	-0.1	950.0	-0.1
125	962.4	956.4	-0.1	954.9	-0.1
130	962.4	960.5	0.0	960.2	0.0
135	962.4	964.8	0.0	965.6	0.0
140	962.4	969.1	0.1	971.1	0.1
145	962.4	973.5	0.1	976.6	0.1
150	962.4	977.7	0.1	982.0	0.2
155	962.4	981.9	0.2	987.3	0.2
160	962.4	985.8	0.2	992.2	0.3
165	962.4	989.5	0.2	996.9	0.3
170	962.4	992.9	0.3	1001.1	0.3
175	962.4	996.0	0.3	1005.0	0.4
180	962.4	998.7	0.3	1008.4	0.4
185	962.4	1001.1	0.3	1011.4	0.4
190	962.4	1003.1	0.4	1013.9	0.5
195	962.4	1004.7	0.4	1015.9	0.5
200	962.4	1006.0	0.4	1017.5	0.5
205	962.4	1006.9	0.4	1018.6	0.5
210	962.4	1007.5	0.4	1019.3	0.5
215	962.4	1007.6	0.4	1019.5	0.5
220	962.4	1007.5	0.4	1019.3	0.5
225	962.4	1006.9	0.4	1018.6	0.5
230	962.4	1006.0	0.4	1017.5	0.5
235	962.4	1004.7	0.4	1015.9	0.5
240	962.4	1003.1	0.4	1013.9	0.5
245	962.4	1001.1	0.3	1011.4	0.4
250	962.4	998.7	0.3	1008.4	0.4
255	962.4	996.0	0.3	1005.0	0.4
260	962.4	992.9	0.3	1001.1	0.3
265	962.4	989.5	0.2	996.9	0.3
270	962.4	985.8	0.2	992.2	0.3
275	962.4	981.9	0.2	987.3	0.2
280	962.4	977.8	0.1	982.1	0.2
285	962.4	973.5	0.1	976.7	0.1
290	962.4	969.1	0.1	971.2	0.1
295	962.4	964.8	0.0	965.6	0.0
300	962.4	960.6	0.0	960.2	0.0
305	962.4	956.5	-0.1	955.0	-0.1
310	962.4	952.6	-0.1	950.0	-0.1
315	962.4	949.0	-0.1	945.4	-0.2
320	962.4	945.7	-0.2	941.1	-0.2
325	962.4	942.9	-0.2	937.4	-0.2
330	962.4	940.4	-0.2	934.1	-0.3
335	962.4	938.3	-0.2	931.4	-0.3
340	962.4	936.5	-0.2	929.1	-0.3
345	962.4	935.2	-0.2	927.3	-0.3
350	962.4	934.2	-0.3	926.0	-0.3
355	962.4	933.4	-0.3	925.0	-0.3
		Max	0.4	dB	0.5
		Min	-0.3		-0.4

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Study Conclusions and Statement of Engineer

CONCLUSIONS BASED ON PRELIMINARY MODELING

The proposed wind turbine is an electrically short tower as it is less than 11% of KYUK's wavelength. The wavelength at 640 kHz is 468.4 meters (1536.8 feet). The wind turbine causes a +0.5 and -0.4 dB change in the circularity of the KYUK antenna pattern. In *47CFR1.3000 Tower Construction or Modifications Near AM Stations* the FCC allows new tower construction to cause up to +/- 2 dB of pattern distortion. If the pattern distortion is above 2 dB the proponent of the new tower is responsible to provide detuning to restore the AM station's antenna performance. No detuning will be required for this proposed facility.

STATEMENT OF ENGINEER

This Engineering Report *RF Electromagnetic Field Reradiation Analysis* for a proposed wind turbine near KYUK (AM), Bethel, Alaska has been prepared by the undersigned or under my direct supervision. All representations contained herein are true to the best of my knowledge. I am an experienced radio engineer whose qualifications are a matter of record with the Federal Communications Commission. I am a partner in the firm of Hatfield and Dawson Consulting Engineers and am Registered as a Professional Electrical Engineer in the States of Washington, Alaska, and Wyoming.

Stephen S. Lockwood, P.E.

December 9, 2015

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ADDENDUM TO DECEMBER 2015 RF ELECTROMAGNETIC FIELD RE-RADIATION ANALYSIS

August 23, 2017

PREPARED FOR

CRW Engineering, LLC

By Broadcast Wind, LLC
And
Hatfield and Dawson, LLC

UPDATED WIND GENERATION FACILITY WITH 75M HUB HEIGHT AND 25.75M ROTOR RADIUS AT REVISED LOCATION SW OF STATION KYUK-AM

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Introduction

CRW Engineering requested a re-run of the 2015 RF Electromagnetic Field Re-Radiation Analysis of radio station KYUK-AM's signal coverage pattern with a new taller wind turbine at a different location, and requested that an analysis of potential interference to the microwave systems on the UUI/CGI communication tower be included. This report is an addendum to the December 2015 report.

AM Radio Coverage Pattern Summary

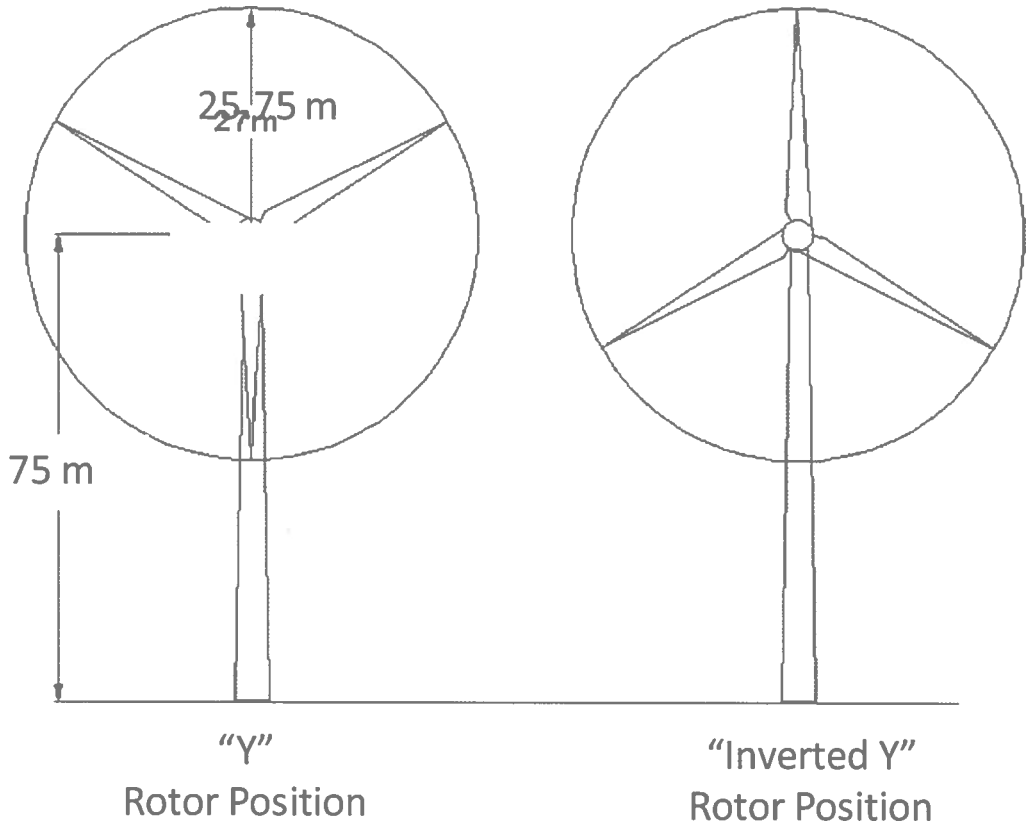
The new location of the wind turbine is at Lat. 60°46'49.57"N, and Lon 161°53'13.18"W about 240 meters SSW of the KYUK-AM radio transmission antenna. The hub height of the new turbine is 75 meters and the rotor radius is 25.75 meters (vs. 50 meters hub height and 27 meters rotor radius for original the turbine analyzed in 2015.

The predicted change in circularity of the KYUK antenna pattern caused by the new wind turbine at its new location is between +1.4 maximum and -2.7 dB, minimum, which slightly exceeds the FCC guidelines of +/- 2 dB for new communications towers. The FCC does not regulate wind turbines

and this amount of distortion to the radio station's coverage pattern would not be excessive, but if a problem should arise, detuning of the turbine is an available option.

AM Radio Analysis Results

As was done for the 2015 analysis, Broadcast Wind engaged Hatfield and Dawson to evaluate the effects of the revised proposed turbine construction on KYUK's antenna coverage pattern. Hatfield and Dawson simulated the rotor in two positions: "Y" and "inverted Y"



The results of Hatfield and Dawson's analysis are as follow:

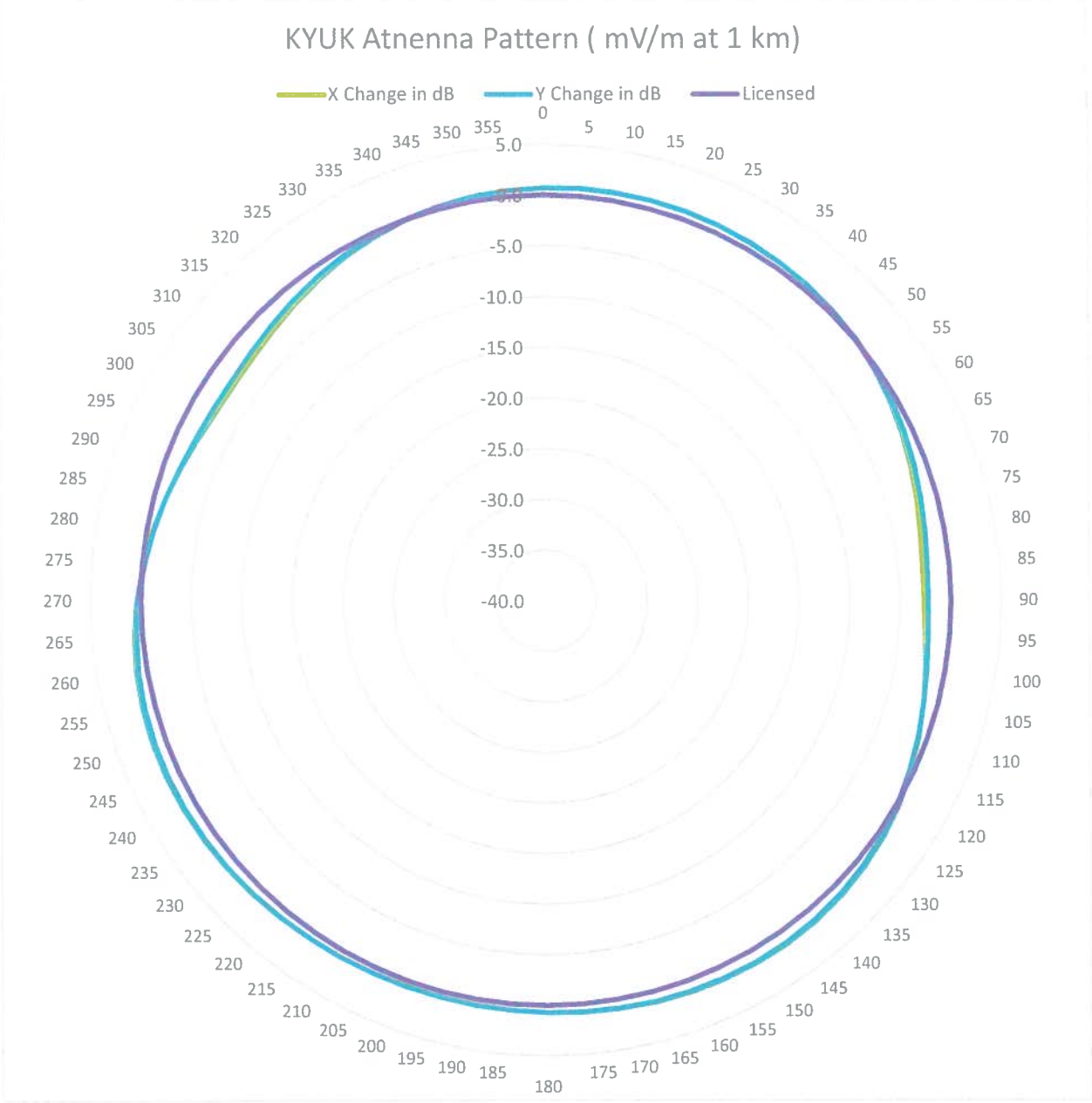
This report and its conclusions are based on data obtained from official FCC databases. Broadcast Wind takes no responsibility for the accuracy of this data.

Azimuth	Licensed	Inverted Y	X Change in dB	Y	Y Change in dB
0	962.4	1,042.4	0.7	1,041.3	0.7
5	962.4	1,052.7	0.8	1,049.7	0.8
10	962.4	1,059.0	0.8	1,054.8	0.8
15	962.4	1,061.6	0.9	1,056.9	0.8
20	962.4	1,060.5	0.8	1,056.1	0.8
25	962.4	1,055.9	0.8	1,052.3	0.8
30	962.4	1,047.4	0.7	1,045.4	0.7
35	962.4	1,034.5	0.6	1,034.8	0.6
40	962.4	1,016.8	0.5	1,020.2	0.5
45	962.4	993.7	0.3	1,001.0	0.3
50	962.4	965.0	0.0	976.9	0.1
55	962.4	930.6	-0.3	947.7	-0.1
60	962.4	891.2	-0.7	914.0	-0.4
65	962.4	848.3	-1.1	876.9	-0.8
70	962.4	804.3	-1.6	838.4	-1.2
75	962.4	763.4	-2.0	801.6	-1.6
80	962.4	730.4	-2.4	770.7	-1.9
85	962.4	711.1	-2.6	750.1	-2.2
90	962.4	709.9	-2.6	743.9	-2.2
95	962.4	728.7	-2.4	754.3	-2.1
100	962.4	765.7	-2.0	780.8	-1.8
105	962.4	816.1	-1.4	820.3	-1.4
110	962.4	873.9	-0.8	868.1	-0.9
115	962.4	933.1	-0.3	918.9	-0.4
120	962.4	988.7	0.2	968.2	0.1
125	962.4	1,037.1	0.6	1,012.3	0.4
130	962.4	1,075.8	1.0	1,048.8	0.7
135	962.4	1,103.8	1.2	1,076.3	1.0
140	962.4	1,121.1	1.3	1,094.5	1.1
145	962.4	1,128.4	1.4	1,103.9	1.2
150	962.4	1,127.1	1.4	1,105.6	1.2
155	962.4	1,119.2	1.3	1,101.1	1.2
160	962.4	1,106.5	1.2	1,092.1	1.1
165	962.4	1,091.1	1.1	1,080.4	1.0
170	962.4	1,074.7	1.0	1,067.5	0.9
175	962.4	1,059.1	0.8	1,054.9	0.8
180	962.4	1,045.4	0.7	1,043.8	0.7
185	962.4	1,034.6	0.6	1,035.0	0.6
190	962.4	1,027.6	0.6	1,029.2	0.6
195	962.4	1,024.5	0.5	1,026.7	0.6
200	962.4	1,025.7	0.6	1,027.7	0.6
205	962.4	1,031.1	0.6	1,032.1	0.6

This report and its conclusions are based on data obtained from official FCC databases. Broadcast Wind takes no responsibility for the accuracy of this data.

Azimuth	Licensed	Inverted Y	X Change in dB	Y	Y Change in dB
210	962.4	1,040.3	0.7	1,039.7	0.7
215	962.4	1,052.9	0.8	1,049.9	0.8
220	962.4	1,067.8	0.9	1,062.0	0.9
225	962.4	1,084.0	1.0	1,074.9	1.0
230	962.4	1,100.1	1.2	1,087.3	1.1
235	962.4	1,114.2	1.3	1,097.7	1.1
240	962.4	1,124.4	1.4	1,104.3	1.2
245	962.4	1,128.8	1.4	1,105.5	1.2
250	962.4	1,125.4	1.4	1,099.6	1.2
255	962.4	1,112.6	1.3	1,085.3	1.0
260	962.4	1,089.2	1.1	1,061.8	0.9
265	962.4	1,055.1	0.8	1,029.1	0.6
270	962.4	1,010.6	0.4	988.0	0.2
275	962.4	957.8	0.0	940.6	-0.2
280	962.4	899.6	-0.6	889.9	-0.7
285	962.4	840.5	-1.2	840.2	-1.2
290	962.4	786.1	-1.8	796.5	-1.6
295	962.4	742.6	-2.3	763.9	-2.0
300	962.4	715.6	-2.6	746.3	-2.2
305	962.4	708.2	-2.7	745.5	-2.2
310	962.4	720.1	-2.5	760.3	-2.0
315	962.4	747.9	-2.2	787.3	-1.7
320	962.4	786.0	-1.8	822.1	-1.4
325	962.4	829.2	-1.3	860.3	-1.0
330	962.4	873.0	-0.8	898.3	-0.6
335	962.4	914.2	-0.4	933.7	-0.3
340	962.4	950.9	-0.1	964.9	0.0
345	962.4	982.1	0.2	991.2	0.3
350	962.4	1,007.5	0.4	1,012.5	0.4
355	962.4	1,027.5	0.6	1,029.0	0.6
		Max	1.4	dB	1.2
		Min	-2.7		-2.2

This report and its conclusions are based on data obtained from official FCC databases. Broadcast Wind takes no responsibility for the accuracy of this data.



This report and its conclusions are based on data obtained from official FCC databases. Broadcast Wind takes no responsibility for the accuracy of this data.

CONCLUSIONS BASED ON PRELIMINARY MODELING

The proposed wind turbine is not an electrically short tower as it is 16% (21% within the inverted Y position) of KYUK's wavelength. The wavelength at 640 kHz is 468.4 meters (1536.8 feet). The wind turbine causes a +1.4 and -2.7 dB change in the circularity of the KYUK antenna pattern. In *47CFR 1.30002 Tower Construction of Modifications Near AM Station* the FCC defines antenna pattern distortion of greater than +/- 2 dB to be significant. These regulations are for communications towers and not wind turbines, as the FCC does not regulate the electrical utility industry. Exceeding this threshold by 0.7 dB using "worst case" modeling would not be excessive pattern distortion for KYUK.

STATEMENT OF ENGINEER

This Engineering Report *RF Electromagnetic Field Reradiation Analysis* for a proposed wind turbine near KYUK(AM), Bethel, Alaska has been prepared by the undersigned or under my direct supervision. All representations contained herein are true to the best of my knowledge. I am an experienced radio engineer whose qualifications are a matter of record with the Federal Communications Commission. I am a partner in the firm of Hatfield and Dawson Consulting Engineers and am Registered as a Professional Electrical Engineer in the States of Washington, Alaska, and Wyoming.

Stephen S. Lockwood, P.E.

This report and its conclusions are based on data obtained from official FCC databases. Broadcast Wind takes no responsibility for the accuracy of this data.

Microwave Analysis Summary

The new location of the wind turbine is at Lat. 60°46'49.57"N, and Lon 161°53'13.18"W approximately 153 meters SW of the UUI/GCI communications tower at Lat. 60°46'52.70"N, and Lon 161°53'4.60"W All the FCC registered and licensed microwave beams with an end-point on the tower or within 100 kilometers of the wind turbine were identified and their clearance distances from the turbine calculated. None intersected the wind turbine. The closest beam's 3rd Fresnel zone was 37.12 meters from the turbine's blades (with the rotor perpendicular to the signal path). The wind turbine at its proposed location will not interfere with the communications systems on the UUI/GCI tower or on an on other towers.

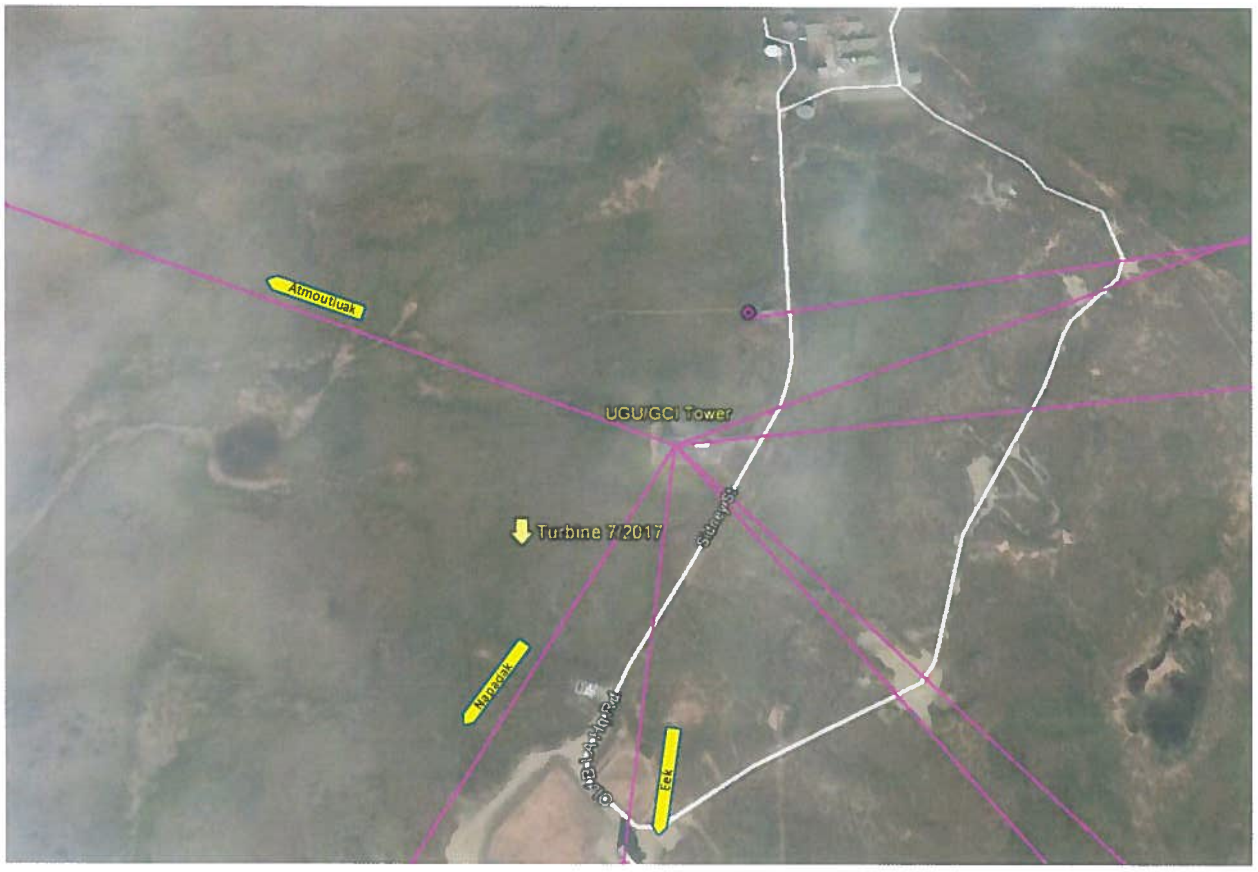
Microwave System Results

37 licensed beams with endpoints less than 100 KM from the tower are registered with the FCC.

			Xmtr Location				Rcvr Location				
Path Pair	Xmtr Site	Rcvr Site	Lat	Lon	Site ASL (m)	Ant AGL (m)	Lat	Lon	Site ASL (m)	Ant AGL (m)	Frequency (MHz)
WQDR574-2	Akiak	Bethel Tower	60.911361	-161.2271944	9.5	22.9	60.781306	-161.8846111	48.5	64	6197.24
WQDR574-3	Akiak	Bethel Tower	60.911361	-161.2271944	9.5	22.9	60.781306	-161.8846111	48.5	64	6212.07
WQDR574-4	Akiak	Bethel Tower	60.911361	-161.2271944	9.5	22.9	60.781306	-161.8846111	48.5	64	6595.00
WQOG739-1	Atmautluak	Bethel	60.858056	-162.2810556	3.4	7.6	60.781306	-161.8846111	48.5	19.8	10735.00
WQNT405-1	Bethel	Eek	60.781306	-161.8846111	48.5	64	60.215944	-162.0120556	12.2	79.2	6034.15
WQNT405-2	Bethel	Eek	60.781306	-161.8846111	48.5	64	60.215944	-162.0120556	12.2	79.2	5945.20
WQOF820-1	Bethel	Atmautluak	60.781306	-161.8846111	48.5	19.8	60.858056	-162.2810556	3.4	7.6	11225.00
WQOF820-2	Bethel	Oscarville	60.781306	-161.8846111	48.5	27.4	60.722000	-161.7683889	1	9.1	19615.00
WQDR573-10	Bethel Tower	Kwethluk	60.781306	-161.8846111	48.5	18.3	60.807000	-161.4251944	2.1	15.2	11215.00
WQDR573-2	Bethel Tower	Eek	60.781306	-161.8846111	48.5	64	60.215806	-162.0119444	7.6	79.2	6725.00
WQDR573-3	Bethel Tower	Kwethluk	60.781306	-161.8846111	48.5	18.3	60.807000	-161.4251944	2.1	15.2	11285.00
WQDR573-4	Bethel Tower	Napaskiak	60.781306	-161.8846111	48.5	15.2	60.707111	-161.7646389	3	8.5	11325.00
WQDR573-5	Bethel Tower	Napaskiak	60.781306	-161.8846111	48.5	15.2	60.707111	-161.7646389	3	8.5	11245.00
WQDR573-6	Bethel Tower	Napakiak	60.781306	-161.8846111	48.5	42.7	60.695833	-161.9825	6.1	13.7	11285.00
WQDR573-7	Bethel Tower	Akiak	60.781306	-161.8846111	48.5	64	60.911361	-161.2271944	9.4	22.9	5945.20
WQDR573-8	Bethel Tower	Akiak	60.781306	-161.8846111	48.5	64	60.911361	-161.2271944	9.4	22.9	5960.03
WQDR573-9	Bethel Tower	Akiak	60.781306	-161.8846111	48.5	64	60.911361	-161.2271944	9.4	22.9	6755.00
WQDR581-1	Eek	Tuntutuliak	60.215806	-162.0119444	7.6	47.9	60.341472	-162.6666944	6.1	21.3	6595.00
WQDR581-2	Eek	Bethel Tower	60.215806	-162.0119444	7.6	79.2	60.781306	-161.8846111	48.5	64	6555.00
WQDR581-3	Eek	Quinhagak	60.215806	-162.0119444	7.6	86.9	59.728694	-161.9074167	6.1	68.6	6286.19
WQNS545-1	Eek	Bethel	60.215944	-162.0120556	12.2	79.2	60.781306	-161.8846111	48.5	64	6404.79
WQNS545-2	Eek	Quinhagak	60.215944	-162.0120556	12.2	86.9	59.728694	-161.9074167	6.1	68.6	6226.89
WQNS545-3	Eek	Bethel	60.215944	-162.0120556	12.2	79.2	60.781306	-161.8846111	48.5	64	6197.24
WQNS545-4	Eek	Quinhagak	60.215944	-162.0120556	12.2	86.9	59.728694	-161.9074167	6.1	68.6	6197.24
WPNG502-2	KWETHLUK	BETHEL	60.807000	-161.4251944	2.1	15.2	60.793944	-161.7631111	5.2	38.1	6845.63
WPNG502-3	KWETHLUK	Bethel Tower	60.807000	-161.4251944	2.1	15.2	60.781306	-161.8846111	48.5	18.3	10795.00
WPNG502-4	KWETHLUK	Bethel Tower	60.807000	-161.4251944	2.1	15.2	60.781306	-161.8846111	48.5	18.3	10715.00
WQDC999-1	KYUK Studio	KYUK Transmitter	60.792500	-161.7727778	7	22	60.782500	-161.8833333	14	7	947.00
WQQA614-1	Napakiak	Bethel	60.695833	-161.9825	6.1	13.7	60.781306	-161.8846111	48.5	42.7	10795.00
WHQ634-2	NAPASKIAK	BETHEL	60.707111	-161.7646389	3	8.2	60.793944	-161.7631111	5.2	57.3	6728.75
WHQ634-3	NAPASKIAK	NAPAKIAK	60.707111	-161.7646389	3	8.2	60.695611	-161.9825556	6.1	7.6	6718.75
WHQ634-4	NAPASKIAK	OSCARVILLE	60.707111	-161.7646389	3	6.1	60.722000	-161.7683889	6.1	8.5	2112.00
WHQ634-5	NAPASKIAK	Bethel AT&T	60.707111	-161.7646389	3	8.2	60.793944	-161.7631111	5.2	57.3	6605.00
WHQ634-6	NAPASKIAK	Bethel Tower	60.707111	-161.7646389	3	8.5	60.781306	-161.8846111	48.5	15.2	10835.00
WHQ634-7	NAPASKIAK	Bethel Tower	60.707111	-161.7646389	3	8.5	60.781306	-161.8846111	48.5	15.2	10755.00
WQOG461-1	Oscarville	Bethel	60.722000	-161.7683889	1	9.1	60.781306	-161.8846111	48.5	27.4	18055.00
WQOG461-2	Oscarville	Napakiak	60.722000	-161.7683889	1	7.6	60.695833	-161.9825	6.1	7.6	11285.00

This report and its conclusions are based on data obtained from official FCC databases. Broadcast Wind takes no responsibility for the accuracy of this data.

Of these 37 beams, 26 have one endpoint on the UUI/GCI communications tower and 11 pass through the region, but do not have an endpoint on the tower. No beam paths intersect the turbine or come close enough to it to pose a risk. Bi-directional beam paths serving Atmautluak (NW), EEK (SSW) and Napakiac (SW) come closest to the wind turbine but are well outside of any area that would cause disruption to the signal.



Path Pair	Xmtr site	Rcvr site	Transmitter Latitude	Transmitter Longitude	Transmitter ASL (m)	Transmitter AGL (m)	Receiver Latitude	Receiver Longitude	Receiver ASL (m)	Receiver AGL (m)	Freq (MHz)		Fresnel zone 1	Fresnel zone 2	Fresnel zone 3
												Turbine			
												Lat	60.780436	60.780436	60.780436
												Lon	-161.886994	-161.886994	-161.886994
												ASL (m)	41	41	41
													Clearance	Clearance	Clearance
WQOG739-1	Atmautluak	Bethel	60.85805556	-162.2810556	3.4	7.6	60.78130556	-161.8846111	48.5	19.8	10735.00		111.32	110.69	110.20
WQNT405-1	Bethel	Eek	60.78130556	-161.8846111	48.5	64	60.21594444	-162.0120556	12.2	79.2	6034.15		90.44	89.47	88.73
WQNT405-2	Bethel	Eek	60.78130556	-161.8846111	48.5	64	60.21594444	-162.0120556	12.2	79.2	5945.20		90.42	89.45	88.70
WQOF820-1	Bethel	Atmautluak	60.78130556	-161.8846111	48.5	19.8	60.85805556	-162.2810556	3.4	7.6	11225.00		111.36	110.74	110.26
WQDR573-2	Bethel Tower	Eek	60.78130556	-161.8846111	48.5	64	60.21580556	-162.0119444	7.6	79.2	6725.00		90.58	89.66	88.96
WQDR573-6	Bethel Tower	Napakiak	60.78130556	-161.8846111	48.5	42.7	60.69583333	-161.9825	6.1	13.7	11285.00		38.56	37.75	37.12
WQDR581-2	Eek	Bethel Tower	60.21580556	-162.0119444	7.6	79.2	60.78130556	-161.8846111	48.5	64	6555.00		90.55	89.62	88.91
WQNS545-1	Eek	Bethel	60.21594444	-162.0120556	12.2	79.2	60.78130556	-161.8846111	48.5	64	6404.79		90.51	89.57	88.85
WQNS545-3	Eek	Bethel	60.21594444	-162.0120556	12.2	79.2	60.78130556	-161.8846111	48.5	64	6197.24		90.47	89.52	88.78
WQQA614-1	Napakiak	Bethel	60.69583333	-161.9825	6.1	13.7	60.78130556	-161.8846111	48.5	42.7	10795.00		38.52	37.68	37.04

This report and its conclusions are based on data obtained from official FCC databases. Broadcast Wind takes no responsibility for the accuracy of this data.

Microwave Analysis Conclusions

The wind turbine will cause no interference to licensed communications systems using the Bethel UUI/GCI communications tower. Microwave beam size is defined in terms of the radius of its Fresnel zones. The zones are nested around the beam center with the closest numbered zone 1, the next: zone 2 and so on. The zone radii are functions of microwave frequency and position along the beam path. Positive clearance of a microwave beam's first Fresnel zone from an object near the beam path center is often considered a sufficient design criterion to avoid signal interference. The clearance of the beams closest to the wind turbine from the first, second, and third Fresnel zones are shown in the above table. All beams' third Fresnel zones clear the turbine blades by wide margins – more than 37 meters.

Only microwave communications systems licensed by the FCC have been considered for this analysis.

This report and its conclusions are based on data obtained from official FCC databases. Broadcast Wind takes no responsibility for the accuracy of this data.

APPENDIX C.
NO HAZARD TO AIR NAVIGATION

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2017-WTW-380-OE

Issued Date: 09/29/2017

Forest Button
Alaska Village Electric Cooperative
4831 Eagle St.
Anchorage, AK 99503

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine EWT 75/52 B (EL 136)
Location:	Bethel, AK
Latitude:	60-46-49.57N NAD 83
Longitude:	161-53-13.18W
Heights:	136 feet site elevation (SE)
	263 feet above ground level (AGL)
	399 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure would have no substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on the operation of air navigation facilities. Therefore, pursuant to the authority delegated to me, it is hereby determined that the structure would not be a hazard to air navigation provided the following condition(s) is(are) met:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (800) 478-3576 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 03/29/2019 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is subject to review if an interested party files a petition that is received by the FAA on or before October 29, 2017. In the event a petition for review is filed, it must contain a full statement of the basis upon which it is made and be submitted to the Manager, Airspace Policy & Regulation, Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591.

This determination becomes final on November 08, 2017 unless a petition is timely filed. In which case, this determination will not become final pending disposition of the petition. Interested parties will be notified of the grant of any review. For any questions regarding your petition, please contact Airspace Regulations & ATC Procedures Group via telephone -- 202-267-8783 - or facsimile 202-267-9328.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above (provided the AGL height does not exceed 499 feet). If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least

one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

This aeronautical study considered and analyzed the impact on existing and proposed arrival, departure, and en route procedures for aircraft operating under both visual flight rules and instrument flight rules; the impact on all existing and planned public-use airports, military airports and aeronautical facilities; and the cumulative impact resulting from the studied structure when combined with the impact of other existing or proposed structures. The study disclosed that the described structure would have no substantial adverse effect on air navigation.

An account of the study findings, aeronautical objections received by the FAA during the study (if any), and the basis for the FAA's decision in this matter can be found on the following page(s).

If we can be of further assistance, please contact Bill Kieffer, at (816) 329-2526, or bill.kieffer@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTW-380-OE.

Signature Control No: 317733944-345015990 (DNH -WT)
Mike Helvey
Manager, Obstruction Evaluation Group

Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2017-WTW-380-OE

Additional information for ASN 2017-WTW-380-OE

Abbreviations
ASN - aeronautical study number
AGL - above ground level
AMSL - above mean sea level
RWY - runway
IFR - instrument flight rules
VFR - visual flight rules
ft. - feet
IAW - in accordance with
OAS - obstacle authoritative source
SE - site elevation
Part 77 - Title 14 CFR Part 77, Safe, Efficient Use and Preservation of the Navigable Airspace

This aeronautical study was conducted on a negotiated location that is approximately 87 feet from the coordinates listed on page 1 and a reduced height of 260 ft. AGL from the original request. This is the corrected information for the proposal:

SE: 139
AGL: 260
AMSL: 399
Latitude/Longitude: 60-46-50.06N 161-53-11.74W

The proposed 260 AGL/399 AMSL wind turbine would be located approximately 5296 ft. west of the proposed approach end of RWY 12 at Bethel Airport (BET) Bethel, Alaska. It is identified as an obstruction under the standards of Part 77 as follows:

Section 77.17(a)(2): A height AGL or airport elevation, whichever is higher, exceeding a height that is 200 ft AGL, or above the established airport elevation, whichever is higher, within 3 nautical miles of the established reference point of an airport, excluding heliports, with its longest runway more than 3,200 ft. in actual length, and that height increases in the proportion of 100 feet for each additional nautical mile from the airport up to a maximum of 499 ft. The proposed wind turbine would exceed this standard by 60 ft. as applied to BET.

Section 77.19(a) - The horizontal surface. The horizontal surface is a horizontal plane 150 ft. above the established airport elevation, continuing out a specified distance from the runway(s) at an airport. The distance out from the runway is based on what type of operations the runway was designed. The structure exceeds this standard by 121 ft.

At the proposed height and location, this structure would exceed VFR traffic pattern airspace, specifically the VFR conical surface, for the BET airport by 108 ft.

The proposal(s) was circularized on June 28, 2017 to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. There were no letters of objection received as a result of the circularization

The proposed wind turbine was originally studied at 345 ft. AGL/481 ft. AMSL. Through negotiations with the sponsor the height was reduced to 260 ft. AGL/399 ft. AMSL.

Aeronautical study disclosed that the proposed structure would have no effect on any existing or proposed arrival, departure, or en route IFR operations or procedures.

Further study for VFR effect revealed that the location of the proposal puts it into close proximity to a group of obstructions some of which have been in place since 1970, asn 2017-AAL-46-OE and OAS 02-000101. The location of the obstructions is charted on the VFR sectional chart and is known to local and transient pilots utilizing the Bethel airport. Grouping the obstructions together minimizes the impact to the VFR traffic pattern. Further mitigating the impact is the requirement of marking/lighting the proposed wind turbine with orange and white paint/lights. The obstructions located in this vicinity are skeletal in nature, the proposed wind turbine is a more solid structure that will increase the conspicuity and make locating the group of obstructions easier for circumnavigation to pilots flying VFR.

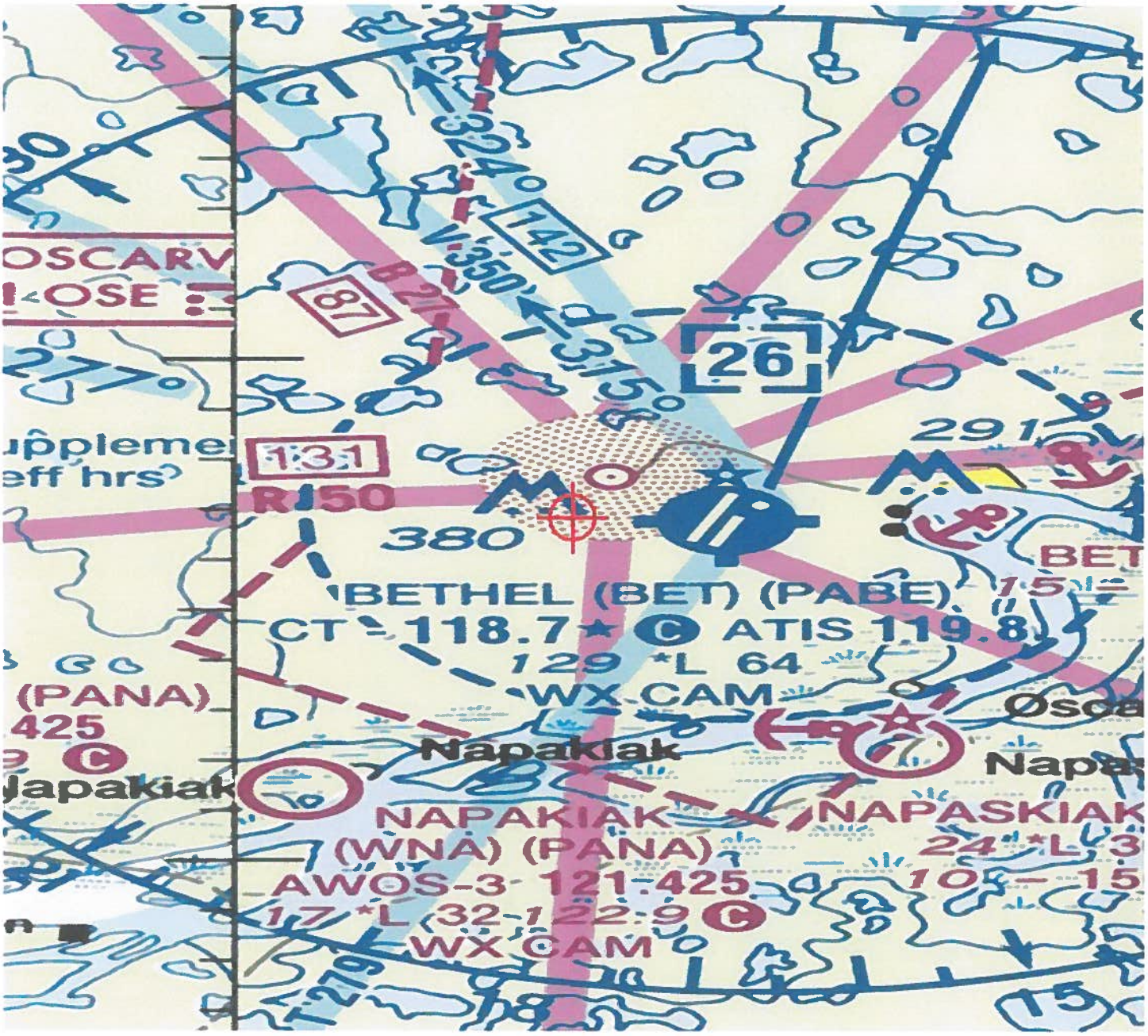
Further study concluded that the proposal would have no effect on VFR en route flight operations.

The cumulative impact of the proposed structure, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports, nor does the proposal affect the capacity of any known existing or planned public-use or military airport.

Therefore, it is determined that the proposed construction would not have a substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on any air navigation facility and would not be a hazard to air navigation provided the conditions set forth within this determination are met.

NOTE: In addition to the lighting requirements on page 1 of this determination and IAW Advisory Circular (AC) 70/7460-1L, this turbine should be painted alternating bands of white and orange on the support structure (mast) as described in Chapter 13 and appendix A (figure A-24), marking of turbines in snow prone areas.

Sectional Map for ASN 2017-WTW-380-OE



APPENDIX D.
U.S. ARMY CORP OF ENGINEERS WETLANDS PERMIT AND CONSULTATIONS

1. USACE permit #POA-2017-403
2. USACE Public Notice of Application for Permit
3. SHPO No Historic Properties Affected Concurrence
4. USACE No Public Comment Received Confirmation

D1. USACE permit #POA-2017-403

DEPARTMENT OF THE ARMY
ALASKA DISTRICT, U.S. ARMY CORPS OF ENGINEERS
REGULATORY DIVISION
P.O. BOX 6898
JBER, AK 99506-0898

OCT 17 2017

Regulatory Division
POA-2017-403

Forest Button
Alaska Village Electric Cooperative
4831 Eagle Street
Anchorage, Alaska 99503

Dear Mr. Button:

Enclosed is the signed Department of the Army (DA) permit, file number POA-2017-403, Kuskokwim River, which authorizes the placement of approximately 3,000 cubic yards of locally available fill material into approximately (0.70 acre) of palustrine wetlands, to develop a fill pad and access road in order to construct a wind turbine. The project site is located within Bethel, Alaska, off of Sidney Street, at Latitude 60.78029° N., Longitude 161.88598° W. Also enclosed is a Notice of Authorization which should be posted in a prominent location near the authorized work.

If changes to the plans or location of the work are necessary for any reason, plans must be submitted to us immediately. Federal law requires approval of any changes before construction begins.

Nothing in this letter excuses you from compliance with other Federal, State, or local statutes, ordinances, or regulations.

Please contact me via email at Jeremy.Grauf@usace.army.mil, by mail at the address above, by phone at (907) 753-2798, or toll free from within Alaska at (800) 478-2712, if you have questions. For more information about the Regulatory Program, please visit our website at www.poa.usace.army.mil/Missions/Regulatory.

Sincerely,

Jeremy Grauf
Regulatory Specialist

Enclosures

DEPARTMENT OF THE ARMY PERMIT

Permittee: Alaska Village Electric Cooperative (AVEC)

Permit No.: POA-2017-403

Issuing Office: U.S. Army Engineer District, Alaska

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description:

The placement of approximately 3,000 cubic yards of locally available fill material, into approximately 0.70 acre of wetlands, to develop a fill pad and access road, in order to construct a wind turbine.

All work will be performed in accordance with the attached plan, sheets **[1-6]**, dated **[July 2017]**.

Project Location:

The project site is located within Bethel, Alaska, off of Sidney Street, at Latitude 60.78029° N., Longitude 161.88598° W. The nearest waterway is the Kuskokwim River.

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on **October 31, 2022**.

If you find that you need more time to complete the authorized activity, submit your request for:

A time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

1. The Permittee shall use only clean fill material for this project. The fill material shall be free from items such as trash, debris, automotive parts, asphalt, construction materials, concrete blocks with exposed reinforcement bars, and soils contaminated with any toxic substance, in toxic amounts in accordance with Section 307 of the Clean Water Act.

2. Self-Certification: Within 60 days of completion of the work authorized by this permit, the Permittee shall complete the attached "Self-Certification Statement of Compliance" form (Enclosure 2017-403_Self-certification Form) and submit it to the Corps (U.S. Army Corps of Engineers, Regulatory Division, P.O Box 6898 JBER, Alaska 99506-0898. In the event that the completed work deviates in any manner from the authorized work, the Permittee shall describe the deviations between the work authorized by this permit and the work as constructed on the "Self-Certification Statement of Compliance" form. The description of any deviations on the "Self-Certification Statement of Compliance" form does not constitute approval of any deviations by the Corps.

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

(X) Section 404 of the Clean Water Act (33 U.S.C. 1344).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, State, or local authorization required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a revaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General Condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

Projects Manager — 10/15/17

(PERMITTEE) AND TITLE — (DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

10-17-2017

FOR (DISTRICT COMMANDER) — (DATE)
Colonel Michael S. Brooks
Jeremy Grauf, Regulatory Specialist
North Branch, Regulatory Division

When the structures or work authorized by this permit are still in existence at the time the property is transferred the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions have the transferee sign and date below.

(TRANSFEREE) — (DATE)

This notice of authorization must be conspicuously displayed at the site of work.

United States Army Corps of Engineers
KUSKOKWIM RIVER

A permit to: PLACE APPROXIMATELY 3,000 CY OF FILL MATERIAL INTO 0.70 ACRE OF PALUSTRINE WETLANDS, TO DEVELOP A FILL PAD AND ACCESS ROAD IN ORDER TO CONSTRUCT A WIND TURBINE

at: SIDNEY STREET, AT LATITUDE 60.78029° N., LONGITUDE 161.88598° W

has been issued to: ALASKA VILLAGE ELECTRIC COOPERATIVE

on: _____ **and expires:** OCTOBER 31, 2017

Address of Permittee: 4831 EAGLE STREET, ANCHORAGE, ALASKA 99503

Permit Number:

POA-2017-403

FOR: *District Commander*
JEREMY GRAUF
PROJECT MANAGER
REGULATORY DIVISION

ENG FORM 4336, Jul 81 (33 CFR 320-330) EDITION OF JUL 70 MAY BE USED (Proponent: CECW-O)

SELF-CERTIFICATION STATEMENT OF COMPLIANCE

Permit Number: POA-2017-403

Permittee's Name & Address (please print or type):_____

_____

_____

Telephone Number:_____

Location of the Work:_____

_____

Date Work Started:_____ Date Work Completed:_____

PROPERTY IS INACCESSIBLE WITHOUT PRIOR NOTIFICATION: YES _____ NO_____
TO SCHEDULE AN INSPECTION PLEASE CONTACT _____
AT _____

Description of the Work (e.g. bank stabilization, residential or commercial filling, docks, dredging, etc.):_____

_____

_____

Acreage or Square Feet of Impacts to Waters of the United States: _____

Describe Mitigation completed (if applicable): _____

_____

_____

Describe any Deviations from Permit (attach drawing(s) depicting the deviations):

_____

_____

I certify that all work and mitigation (if applicable) was done in accordance with the limitations and conditions as described in the permit. Any deviations as described above are depicted on the attached drawing(s).

_____
Signature of Permittee

_____
Full Name of Permittee (printed or typed)

_____
Date

REMITTANCE REGISTER *(ER 37-2-10)*	DATE PREPARED October 10, 2017	CONTROL NO. *(Number Consecutively)*
	PREPARING ELEMENT CEOPA-RD (JJG)	INVITATION NO. *(Where Aplicable)*

ITEM OR BID NO.	RECEIVED FROM *(Name of Remittor or Bidder)*	TYPE OF REMITTANCE *(Check Applicable Col.)*				REMITTANCE NO.	AMOUNT
		CH	MO	DFT	CASH		
Permit	POA-2017-403	X					$100.00
	Alaska Village Electric Cooperative						
	Attn: Forest Button						
	4831 Eagle Street						
	Anchorage, Alaska 99503						

SIGNATURE OF DESIGNEE PREPARING REGISTER	SIGNATURE OF AUTH. PERSONNEL ACKNOWLEDGING RECEIPT

D2. USACE Public Notice of Application for Permit

-----Original Message-----
From: Martinez, Rebecca J CIV USARMY CEPOA (US) [mailto:Rebecca.J.Martinez@usace.army.mil]
Sent: Friday, August 18, 2017 8:14 AM
To: fbutton@avec.org; Robin Reich <robin@solsticeak.com>; Representative Young Office - <catherine.petty@mail.house.gov>; Senator Sullivan Office – <carrie_keil@sullivan.senate.gov>; Senator Murkowski Office – <services@murkowski.senate.gov>; gpeltola@nativecouncil.org; mstevens@avcp.org; naparyaraq@hughes.net; fjenkins@napaskiak.org; AK Commerce & Regional Affairs-Diane Sam <diane.sam@alaska.gov>; AK DEC-James Rypkema-404/401 cert <james.rypkema@alaska.gov>; AK DEC-Shannon Dewandel-404/401 tech <shannon.dewandel@alaska.gov>; AK OPM Projects & Permitting- Anne L. Johnson <anne.johnson@alaska.gov>; AK DNR-Office of History & Archeology (SHPO <oha.revcomp@alaska.gov>; AK DNR- Jusdi McDonald-Permitting/ Southcentral Region Land <jusdi.mcdonald@alaska.gov>; Alan Bailey <abailey@petroleumnews.com>; Alaska Railroad-Douglas Stephens-Real Estate <StephensD@akrr.com>; Alaska Railroad-Jeanette Greenbaum-Environmental Analyst <greenbaumJ@akrr.com>; Anchorage Daily News <newsroom@adn.com>; Anchorage Daily News-Kim Fararo <biz@adn.com>; Alaska Dispatch News-Alex Demarban <alex@alaskadispatch.com>; Bellingham Marine Industries - Pamela Anderson-Office <panderson@bellingham-marine.com>; Bellingham Marine Industries - Jim Engen <jengen@bellingham-marine.com>; BLM-Richard Kemnitz <rkemnitz@blm.gov>; Bob Berto <bobb@claalaska.com>; Bob Charles- Knik Tribe <BCharles@kniktribe.org>; Brotherton Pipeline <BrothertonPipeline@gmail.com>; Bruce Abraham <bruce@topperfloats.com>; Pagemaster, Reg POA <regpagemaster@usace.army.mil>; Cheryl Moody <cmoody@3PPI.net>; Craig Dylan Wyatt <cwyatt@nrdc.org>; Dan Collins <dcollins@traylor.com>; Urban, David <David@ecosystempartners.com>; Don Kiely <donkiely@computer.org>; Earth Justice-Iris Korhonen <ikorhonen@earthjustice.org>; Earth Justice-Sarah Saunders <ssaunders@earthjustice.org>; EPA Wetlands Division HQ-

D.C. <404PNS-R10-OW@epa.gov>; EPA Aquatic Resources Unit <AOOARU.R10@epamail.epa.gov>; EPA Aquatic Resources Unit-Anc-Mark Douglas <douglas.mark@epa.gov>; Erin Clay - City of Sitka <erin.clay@cityofsitka.org>; Eyak Preservation Council-Carol Hoover <eyak@redzone.org>; FAA-Environmental Program Manager-Statewide <leslie.grey@faa.gov>; GCI-Gretchen Stoddard <mgstoddard@gci.net>; Hayley Steele-Advanced Ecology, Ltd. <hsteele@adv-eco.com>; HDR, Inc.-Dave Casey <Dave.Casey@hdrinc.com>; HDR, Inc.-Mark Dalton <mdalton@hdrinc.com>; HDR, Inc.-Paul McLarnon <Paul.McLarnon@hdrinc.com>; Ibsen Company-Ron Ibsen <ron@ibsenco.com>; Kelly Thompson <Kelly.Thompson@aicllc.com>; Kinnetic Laboratories <msavoie@kinneticlabs.com>; Merco Marine <merco@mercomarine.com>; Michael Swalling <mswalling@swalling.com>; Millard Barney <mbarney@concretetech.com>; MOA-Nicole K. Jones-Vogel <Jones-VogelNK@muni.org>; Monty Rogers <monty.rogers@gmail.com>; Nancy Wainwright <nsw@alaskan.com>; National Marine Fisheries Service-Jeanne Hanson <hcd.anchorage@noaa.gov>; National Park Service-Environmental Compliance-Joan Kluwe <joan_kluwe@nps.gov>; NOAA-Doug Baird <doug.baird@noaa.gov>; Pacific Habitat Services <jvs@pacifichabitat.com>; Pacific Pile & Marine <stevea@pacificpile.com>; Pamela Miller <pammillerarctic@gmail.com>; PDC Engineering-Royce Conlon <RoyceConlon@PDCENG.US>; Petroleum News-Kay Cashman <publisher@petroleumnews.com>; Petroleum News-Kristen Nelson <knelson@petroleumnews.com>; Pioneer Reserve-Calli Donn <pioneerreserve@hotmail.com>; WHPacific-Phil Quarterman <PQuarterman@whpacific.com>; WHPacific-Bruce Moreira <bmoreira@whpacific.com>; Richard Martin- Knik Tribe <RMartin@kniktribe.org>; Sea Pilot Dispatch <pilots@seapa.com>; Seattle Journal of Commerce <Lisa.Lannigan@djc.com>; SE Watershed Coalition-Jess Kayser <jess.kayser@sawcak.org>; SE Watershed Coalition-Angie Flickenger <angie@sawcak.org>; Steve Braund <srba@alaska.net>; Tamara Sheffield <sheffield@aoga.org>; Ted Weatherly <TedWeatherly@comcast.net>; Tom Mortensen <tom@mortensen.com>; Transpac Marinas <info@transpacmarinas.com>; Miller, Jeff <Jeff_Miller@treated-wood.org>; Trustees For Alaska-Jennie Frost (paralegal <jfrost@trustees.org>; University of Alaska Fairbanks <rgmiller@alaska.edu>; United States Coast Guard <D17-PF-DPW-ACOE1@uscg.mil>; US Fish & Wildlife Service <FW7_POANotices@fws.gov>; ADF&G-DH-Megan Marie <megan.marie@alaska.gov>; ADF&G-Division Habitat-Palmer-Sarah Wiber <Sarah.Wilber@alaska.gov>; Alaska Department of Natural Resources-Travis Jensen <travis.jensen@alaska.gov>; AKDOT-Brian Elliott <brian.elliott@alaska.gov>; Calista Corporation-June McAtee <jmcatee@calistacorp.com>; Cathy Gleason <cathy.gleasontcc@yahoo.com>; Chugach Electric <Karen_Keesecker@chugachelectric.com>; City of Houston-clerk <clerk@houston-ak.gov>; Cook Inlet Aquaculture Association <gfandrei@ciaanet.org>; Cook Inlet Keeoper-Robert Shavelson <bob@inletkeeper.org>; Federal Highway Administration-Alaska Division <alaska.fhwa@fhwa.dot.gov>; GCI <rcolton@gci.com>; Passage Canal Development LLC - James Barnett-GM <Jbarnett@alaskan.com>; KDLG-Dillingham Public Radio <info@kdlg.org>; Kenai Peninsula Borough-Planning-Max Best <MBest@kpb.us>; Kenai River Center <KenaiRivCenter@kpb.us>; Kenai River Center - Nancy Carver <ncarver@kpb.us>; Kenai River Center - Tom Dearlove <tdearlove@kpb.us>; Knik Tribe-Bob Charles <BCharles@kniktribe.org>; Knik Tribe-Richard Martin <RMartin@kniktribe.org>; Matanuska Electric Association-Environmental Engineer <Traci.Bradford@mea.coop>; Matanuska Electric Association- Right of Way <mearow@matanuska.com>; Mat Su Borough Development Services-Theresa Taranto <Theresa.Taranto@matsugov.us>; National Park Service-James Capra <james_capra@nps.gov>; Northern Alaska Environmental Center <mickley@northern.org>; North Star Maritime <trueter@alaska.net>; Northern Stevedoring & Handling <lauram@northstarak.com>; Robin Bronen <rbronen@yahoo.com>; The Aleut Corporation <msmith@aleutcorp.com>; Thede Tobish <tobishtg@muni.org>; ADOT &PF- Brett Nelson <brett.nelson@alaska.gov>; ADNR-DMLW-Fairbanks-Julie Smith <julie.smith@alaska.gov>; Alaska Dept Fish & Game-DH Supervisor-Audra Brase <audra.brase@alaska.gov>; Alaska Dept Fish & Game-DH- Jack Winters <jack.winters@alaska.gov>; Alaska Riverways, Inc. <skip@riverboatdiscovery.com>; BLM-Richard Kemnitz <rkemnitz@blm.gov>; Chena Riverfront Commission-Lee Wood <leeawood@hotmail.com>; EPA-Tracy Peak <peak.tracy@epa.gov>; Drake Construction, Inc. <tdrake@drakeconstruction.net>; Fairbanks Sand and Gravel <fsgalaska@gmail.com>; Federal Highway Administration-Alaska Division <alaska.fhwa@fhwa.dot.gov>; FNSB Community Planning <planning@fnsb.us>; Northern Alaska Environmental Center <mickley@northern.org>; PDC Engineering-Royce Conlon <royceconlon@pdceng.us>
Cc: Pagemaster, Reg POA <regpagemaster@usace.army.mil>; Grauf, Jeremy J CIV USARMY CEPOA (US) <Jeremy.Grauf@usace.army.mil>
Subject: POA-2017-403, Kuskokwim River_PN (UNCLASSIFIED)

CLASSIFICATION: UNCLASSIFIED

Interested parties are hereby notified that a Department of the Army permit application has been received for work in waters of the United States.

PUBLIC NOTICE DATE: August 18, 2017

EXPIRATION DATE: September 18, 2017

REFERENCE NUMBER: POA-2017-403

WATERWAY: Kuskokwim River

APPLICANT: Forest Button, Alaska Village Electric Cooperative (AVEC), 4831 Eagle Street, Anchorage, Alaska 99503, 907-561-1818, fbutton@avec.org

LOCATION: The project site is located within Bethel, Alaska, off of the Old BIA Road, at Latitude 60.78029º N., Longitude 161.88598º W

PURPOSE: The applicant's stated purpose is to install a wind turbine in Bethel to provide renewable, clean, and affordable energy for Bethel, Oscarville, and Napakiak.

CONTACT: Please contact Jeremy Grauf at (907) 753-2798, toll free from within Alaska at (800) 478-2712, by fax at (907) 753-5567, or by email at Jeremy.Grauf@usace.army.mil if further information is desired concerning this notice.

The full text of this public notice, as well as associated maps and drawings, are available on our website at: http://www.poa.usace.army.mil/Missions/Regulatory/PublicNotices.aspx

If you would like to be removed from this mailing list, please reply with "Opt Out" in subject line.

**NOTICE TO EDITORS: This public notice is provided as background information and is not a request or contract for publication.

**NOTICE TO POSTMASTERS: It is requested that this notice be conspicuously and continually placed until the expiration date.

U.S. Army Corps of Engineers
Alaska District
Regulatory Division, CEPOA-RD
2204 3rd Street, Post Office Box 6898
JBER, Alaska 99506-0898

The understanding and support of Alaskans is vital to the success of the Regulatory Program. We must work together to protect Alaska's water resources, ensuring their use and enjoyment for future generations, while enabling responsible development.

Regulatory Division website:
http://www.poa.usace.army.mil/Missions/Regulatory/RegulatoryContacts.aspx

D3. SHPO No Historic Properties Affected Concurrence

8-29-17 3130-1R CCE

DEPARTMENT OF THE ARMY
ALASKA DISTRICT, U.S. ARMY CORPS OF ENGINEERS
REGULATORY DIVISION
P.O. BOX 6898
JBER, ALASKA 99506-0898

August 18, 2017

Regulatory Division
POA-2017-403

MSJ No Historic Properties Affected
Alaska State Historic Preservation Officer
Date: 8-29-17 File No.: 3130-1R CCE 2017-00963
Please review: 36 CFR 800.13 / A.S. 41.35.070(d)

Office of History and Archaeology
Attention: Ms. Judith Bittner
550 W. 7th Avenue, Suite 1380
Anchorage, Alaska 99501-3561

Dear Ms. Bittner:

This letter is in regard to Alaska Village Electric Cooperative (AVEC) application for a Department of the Army (DA) permit to place approximately 3,162 cubic yards of locally available fill material, into approximately 0.72 acre of wetlands, to develop a fill pad and access road, in order to build a wind turbine. It has been assigned file number POA-2017-403, Kuskokwim River which should be referred to in all future correspondence with this office. The project site is located within Bethel, Alaska, off of the Old BIA Road, at Latitude 60.78029° N., Longitude 161.88598° W.

This letter constitutes consultation pursuant to Section 106 of the National Historic Preservation Act and 33 CFR 325 Appendix C. The permit area has been determined to be the entire project area. Based on the information provided by the AHRS, the project is located in the vicinity of site BTH-00142. The Corps has determined that there would be "No Historic Properties Affected" as a result of the proposed project. This determination was made because the project would impact up to 0.72 acre of wetlands and the magnitude and scope of the fill placement constitutes a broad impact and has the potential to effect unknown historic properties. We are hereby seeking your concurrence on these findings within 30 days from the date of this letter.

All work would be performed in accordance with the enclosed plan (sheets 1-6), dated July 2017.

Please contact me via email at Jeremy.Grauf@usace.army.mil, by mail at the address above, by phone at (907) 753-2798.

D4. USACE No Public Comment Received Confirmation

> -----Original Message-----
> From: Grauf, Jeremy J CIV USARMY CEPOA (US)
> [mailto:Jeremy.Grauf@usace.army.mil]
> Sent: Thursday, September 28, 2017 9:58 AM
> To: Robin Reich <robin@solsticeak.com>
> Subject: RE: POA-2017-403 Bethel Wind Turbine-Kuskokwim River, SHPO
> Concurrence
>
> Hi Robin,
>
> We did not receive any comments for this project during the public notice period. ADEC is still working on their 401 certification.
>
> I will let you know when we are completed with our evaluation.
>

> Thanks,
>
>
> Jeremy Grauf
> Regulatory Specialist/GIS Specialist
> US Army Corp of Engineers, Alaska District Regulatory Division
> CEPOA-RD-NN, North Section PO Box 6898 JBER, Alaska 99506
> Office: 907-753-2798
>
>
>
>
>
> -----Original Message-----
> From: Robin Reich [mailto:robin@solsticeak.com]
> Sent: Thursday, September 28, 2017 9:55 AM
> To: Grauf, Jeremy J CIV USARMY CEPOA (US)
> <Jeremy.Grauf@usace.army.mil>
> Cc: Olivia Cohn <olivia@solsticeak.com>
> Subject: [EXTERNAL] RE: POA-2017-403 Bethel Wind Turbine-Kuskokwim
> River, SHPO Concurrence
>
> Hi-
> Did we receive any comments during the public notice period that we need to address?
>
> Thanks.
>
> Robin Reich
> Office: 907.929.5960
> Cell: 907.903.0597
>
> -----Original Message-----
> From: Grauf, Jeremy J CIV USARMY CEPOA (US)
> [mailto:Jeremy.Grauf@usace.army.mil]
> Sent: Wednesday, August 30, 2017 9:13 AM
> To: Robin Reich <robin@solsticeak.com>
> Cc: Olivia Cohn <olivia@solsticeak.com>
> Subject: FW: POA-2017-403 Bethel Wind Turbine-Kuskokwim River, SHPO
> Concurrence
>
> Hi Robin,
>
> Please see the attached concurrence with letter from SHPO for the Bethel Wind Turbine Project.
>
> Thanks,
>
> -Jeremy Grauf
>
> -----Original Message-----
> From: Johnson, McKenzie S (DNR) [mailto:mckenzie.johnson@alaska.gov]
> Sent: Tuesday, August 29, 2017 3:15 PM
> To: Grauf, Jeremy J CIV USARMY CEPOA (US)

> <Jeremy.Grauf@usace.army.mil>
> Subject: [EXTERNAL] POA-2017-403 Bethel Wind Turbine-Kuskokwim River,
> SHPO Concurrence
>
> Hello Jeremy, please see the attached stamped concurrence with a finding of 'no historic properties affected' for the subject project. Thank you.
>
>
>
> Mckenzie S. Johnson
>
> Archaeologist I, Review and Compliance
>
> Alaska State Historic Preservation Office/Office of History and
> Archaeology
>
> 550 W. 7th Ave, Suite 1310
>
> Anchorage, AK 99501
>
> Phone: 907-269-8726
>
> E-mail mckenzie.johnson@alaska.gov
>
>
>
> Please note that the Office of History and Archaeology / State Historic Preservation Office is temporarily moving to the 2nd Floor of the Atwood Building while our space on the 13th floor is reorganized to accommodate additional State departments. We hope to return to the 13th Floor by October 2017. Our contact information is unchanged. Please pardon any delays or minor disruptions in services during this time and thank you for your patience.
>
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##
This e-mail message has been scanned for Viruses and Content and cleared by MailMarshal
##

APPENDIX E.
PRE-APPLICATION MEETING DOCUMENTATION

Alaska Village Electric Cooperative, Inc., Bethel Wind Project
October 2017 Special Use Permit Pre-Application

PRE-APPLICATION MEETING

The Alaska Village Electric Cooperative (AVEC) met with the City of Bethel on July 28, 2017.

This meeting included City of Bethel representatives (Pete Williams, Ted Meyer, Betsy Jumper); AVEC representatives (Anna Sattler, Forest Button, Onya Stein), and Solstice Alaska Consulting, Inc. (SolsticeAK) representatives (Robin Reich, Olivia Cohn).

Following the meeting, Olivia Cohn and Ted Meyer conducted a site visit for the proposed wind turbine location at this time.

Olivia Cohn

Subject:	Bethel Wind Project Pre-Application Meeting
Location:	Conference Call: 800-315-6338; Access Code: 58571
Start:	Fri 7/28/2017 1:30 PM
End:	Fri 7/28/2017 2:30 PM
Recurrence:	(none)
Meeting Status:	Meeting organizer
Organizer:	Olivia Cohn
Required Attendees:	Robin Reich; 'tmeyer@cityofbethel.net'; Forest Button; Onya Stein; Anna Sattler

Hello all:

Please accept this appointment as a calendar hold for a Special Use Permit pre-application teleconference meeting for the Bethel Wind Project.

We may use the Solstice conference call line at: **800-315-6338, Access Code: 58571** for this meeting.

This meeting will be an opportunity to discuss the Bethel tall towers ordinance, Ordinance #15-27, and the Special Use Permit stipulations and permitting process described in the ordinance.

It is required within Ordinance #15-27 to have a pre-application meeting "...discussing the site and development proposal, and to address any issues that will help expedite the review and permitting process..." At the end of the call, we can discuss with Planning Director Ted Meyer if this conversation meets these goals in the ordinance.

Thank you,

Olivia Cohn
Environmental Planner
Solstice Alaska Consulting, Inc.
2607 Fairbanks Street, Suite B, Anchorage, AK 99503
907-929-5960 | olivia@solsticeak.com
www.solsticeak.com

4. NARRATIVE

Alaska Village Electric Cooperative, Inc.
Bethel Wind Project
October 2017 Special Use Permit
Public Hearing Application

NARRATIVE

Contents

Nature of the Bethel Wind Project 1
Compliance with Bethel Municipal Code 1
Special Use Permit Applicability 1

Nature of the Bethel Wind Project

As described in the Project Description, Letter of Intent, and Visual Impacts Analysis, the Alaska Village Electric Cooperative, Inc. (AVEC) would like to erect a wind turbine at approximately latitude 60.78029, longitude -161.88598. The project purpose to install a wind turbine to provide renewable energy for Bethel, Oscarville, and Napakiak, and the project need to reduce fuel use to increase energy stability and affordability is described in the Project Description. A description of the proposed wind turbine and supporting proposed actions (an access road and building pad) are detailed within the Project Description, as well.

Compliance with Bethel Municipal Code

AVEC understands Bethel Municipal Code (BMC) chapter 16.10.070 Permits Requested, that denotes that "All applicants for a permit and any modification of such must comply with the requirements set forth in this chapter [16.10.070]," and that "No person shall be permitted to place, build, construct, modify, prepare, replace or remove any Tall Structure or appurtenant equipment without having first obtained the appropriate permit from the City."

Special Use Permit Applicability

AVEC is applying for a Special Use Permit for the Bethel Wind Project and believes this permit fits the proposed action as a Special Use Permit is defined for "...all new Tall Structures regardless of height or zoning location," BMC chapter 16.10.070. AVEC further understands that the Bethel Wind Project requires a Special Use Permit per the definitive of a "Tower" in BMC 16.10, Section 37, "37. "Tower" means a vertical projection composed of metal or other material designed for the purpose of accommodating antennas, wind turbine equipment, or other equipment.

Accordingly, AVEC has taken careful and thoughtful consideration in preparing the application documents for a Special Use Permit as detailed in the Public Hearing Application Forms and Requirements Request for Public Hearing Checklist.

5. OWNER AUTHORIZATION FORM

RECEIVED
OCT 10 2017
AVEC

PROPERTY OWNER AUTHORIZATION

Property Owner Information: (Use separate sheet for each owner)

Contact Name: Ana Hoffman Bethel Native Corporation Telephone #: (907) 543-2124

Mailing Address: P.O. Box 719

City: Bethel State: AK Zip Code: 99559

Authorization:

I do solemnly swear and attest, subject to criminal penalties for perjury, that I am the legal owner, as reflected in the Records of the State of Alaska, of the property identified below, which is the subject of the attached Application for Public Hearing before the City of Bethel, Alaska.

As the legal owner of record of the subject property, I hereby authorize the individual named below to act as the applicant in the pursuit of the Application for Public Hearing in request of the items indicated below.

[X] Special Use Permit [ ] Rezoning [ ] Variance

[ ] Other: _____

Name of Authorized Applicant: Alaska Village Electric Cooperative

Mailing Address: 4831 Eagle Street

City: Anchorage State: AK Zip Code: 99503

Phone #: (907)561-1818 Email: mkohler@avec.org Cell #: _____

So Sworn and Attested:

Owner Signature — Date: 10/5/17

Notary Signature — Date: 10/5/17

GLENDA E. CHANEY
My Commission Expires
NOTARY PUBLIC
With Office
STATE OF ALASKA

GLENDA E. CLANEY
NOTARY
PUBLIC
STATE OF ALASKA

6. FULL-SIZE SITE PLAN WITH SITE PLAN CHECKLIST

SITE PLAN PERMIT

No. 17-55 DATE: 10/24/2017

PERMITEE: **Alaska Villages Electric Coop**	Address: Tract 49, portion of Section 15			
Lot: LOT 5	Block:	Subdivision:	Plat No.:	R./T./Sec.: T8N, R72W, SM

Authorized and mandatory Improvements:

1. Construct a gravel pad, foundation and access road for proposed wind turbine project.
2. This permit is for groundwork only.

PER SITE PLAN APPLICATION ON FILE.

PLANNING DEPARTMENT: Betsy Juyer, City Planner

[redacted]

Intended Use: Commercial

This permit has hereby been posted on the above property this __day of __, _____

By_____.

Your Signature

ALASKA VILLAGE ELECTRIC COOPERATIVE, INC.

October 4, 2017

Betsy Jumper, Planning Director
City of Bethel
P.O. Box 1388
Bethel, Alaska 99559

RE: Alaska Village Electric Cooperative, Inc. Bethel Wind Project
Site Plan Application

Dear Ms. Jumper:

With this letter, the Alaska Village Electric Cooperative, Inc. (AVEC) submits their site plan application for the placement of an access driveway, pad, and foundation for a future wind turbine.

Please note, we would appreciate your consideration of this application during the October 12, 2017 Planning Commission meeting.

AVEC understands that this approval is only for the site work for the wind turbine and that compliance with the City's Tall Tower Ordinance will be required prior to turbine erection.

If you have questions or would like additional information, contact our consultant, Robin Reich, via email at robin@solsticeak.com or telephone at 907-929-5960.

Sincerely,

Meera Kohler
President and CEO

Enclosures: Site Plan Checklist
Site Plan

cc: Patty Burley, City of Bethel
Peter Williams, City of Bethel
Forest Button, AVEC
Anna Sattler, AVEC
John Andrew Leman, Counsel for AVEC, Kemppel, Huffman and Ellis, P.C.

4831 Eagle Street • Anchorage, Alaska 99503-7497 • Phone (907) 561-1818 • In State (800) 478-1818 • Fax (907) 563-9304

Alaska Village Electric Cooperative, Inc.
Bethel Wind Project

SITE PLAN CHECKLIST

*This document is provided as a resource for the Applicant to assist in the preparation of site plans to be submitted with the application package for a wind tower Special Use Permit. The items listed below reflect the **minimum** information that must be included on all site plans submitted as part of the administrative review process.*

		ELEMENTS DESCRIPTION
	X	Key and/or legend and site location map with North arrow
	X	Boundary survey of subject property which includes metes and bounds along property lines.
	X	Acreage of the subject property.
	X	Location of land lot lines and identification of land lots.
N/A		Current zoning of the subject site and adjoining properties.
	X	The location and dimensions of the entire site area and the exact location of the support structure, any ground-mounted equipment and additional support equipment (if applicable)
	X	Proposed setbacks, buffers, landscaping and other development or site features.
	X	Existing, proposed, and future reserved rights-of-way of all streets and roads adjacent to and on the subject property.
	X	Proposed access driveways and the available intersection sight distance and proposed parking spaces, loading and unloading facilities.
	X	Existing buildings (with square footages, heights, and stories), driveways, fences, utility equipment, and any other structures or improvements on the subject property.
	X	Topography of the subject site.
N/A		Existing setbacks and buffers.
N/A		100-year flood plan horizontal limits and flood zone designations as shown on FEMA survey or FEMA FIRM maps. Wetlands shown on GIS maps or survey.
N/A		Required and proposed storm water management facilities (if applicable) and existing lakes, streams and other waters on the site and associated buffers.
	X	Existing driveways located within 150 feet of the subject property on adjacent or nearby parcels (including those parcels on the opposite side of a public street).

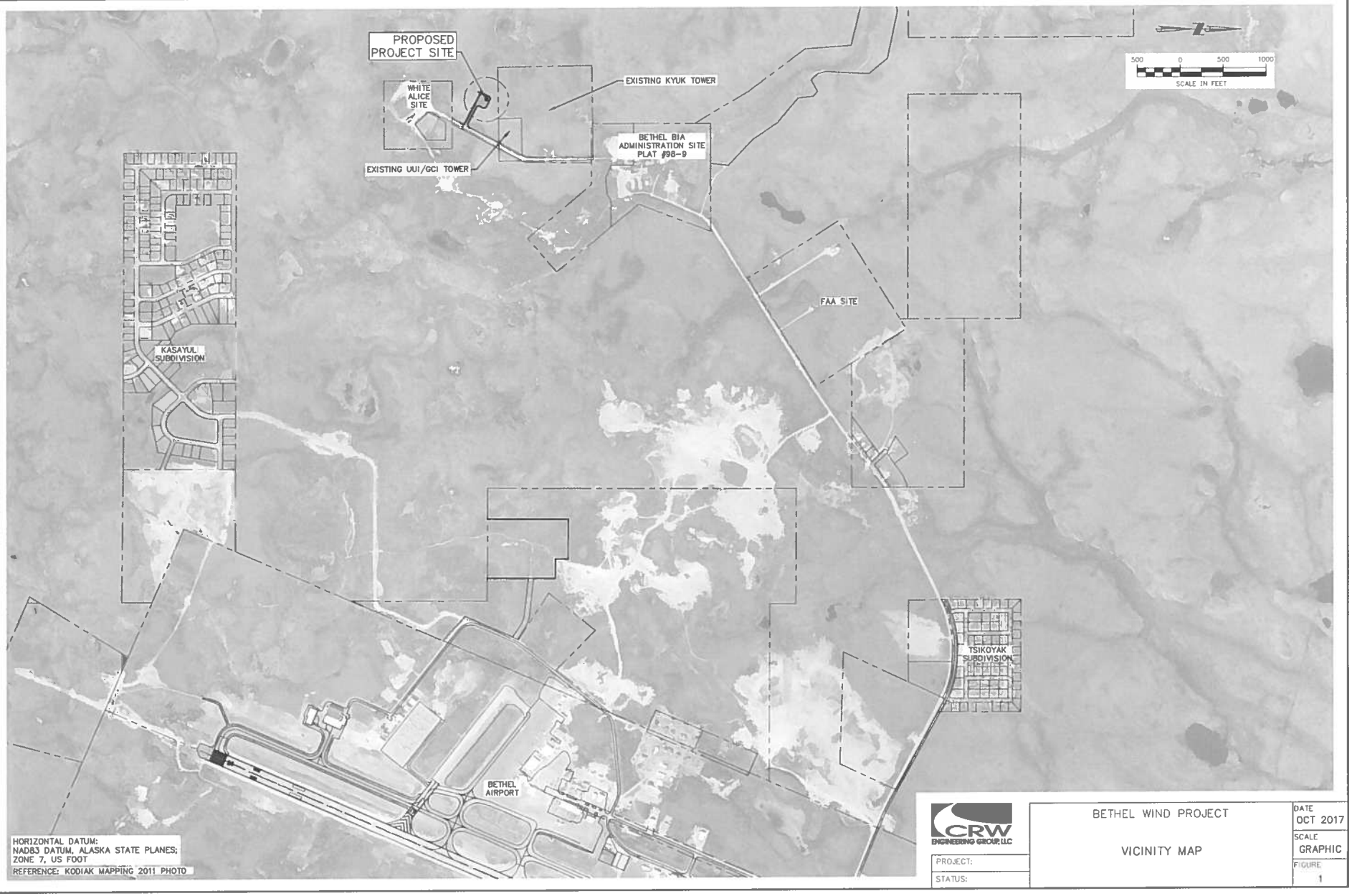
Alaska Village Electric Cooperative, Inc.
Bethel Wind Project
Site Plan Approval Request

Attached Site Plan Figures:

Figure 1. Vicinity Map
Figure 2. Proposed Site Plan
Figure 3. Wetlands

Notes:

1) The acreage of the subject property is 7.98 acres.
2) The site is outside City of Bethel zoned areas.
3) There is a proposed no-build easement on the north side of the property.
4) There are no existing structures on the property.
5) There are not existing setbacks or buffers adjacent to the site.
6) The site is outside the FEMA survey or FEMA FIRM map boundaries.
7) Wetlands, as determined by an onsite survey, are shown on Figure 3 by wetland type (PSS3/1B, PSS1/EM1B, PSS1/3C).
8) No storm water management facilities are proposed.



CRW ENGINEERING GROUP, LLC

PROJECT:

STATUS:

BETHEL WIND PROJECT

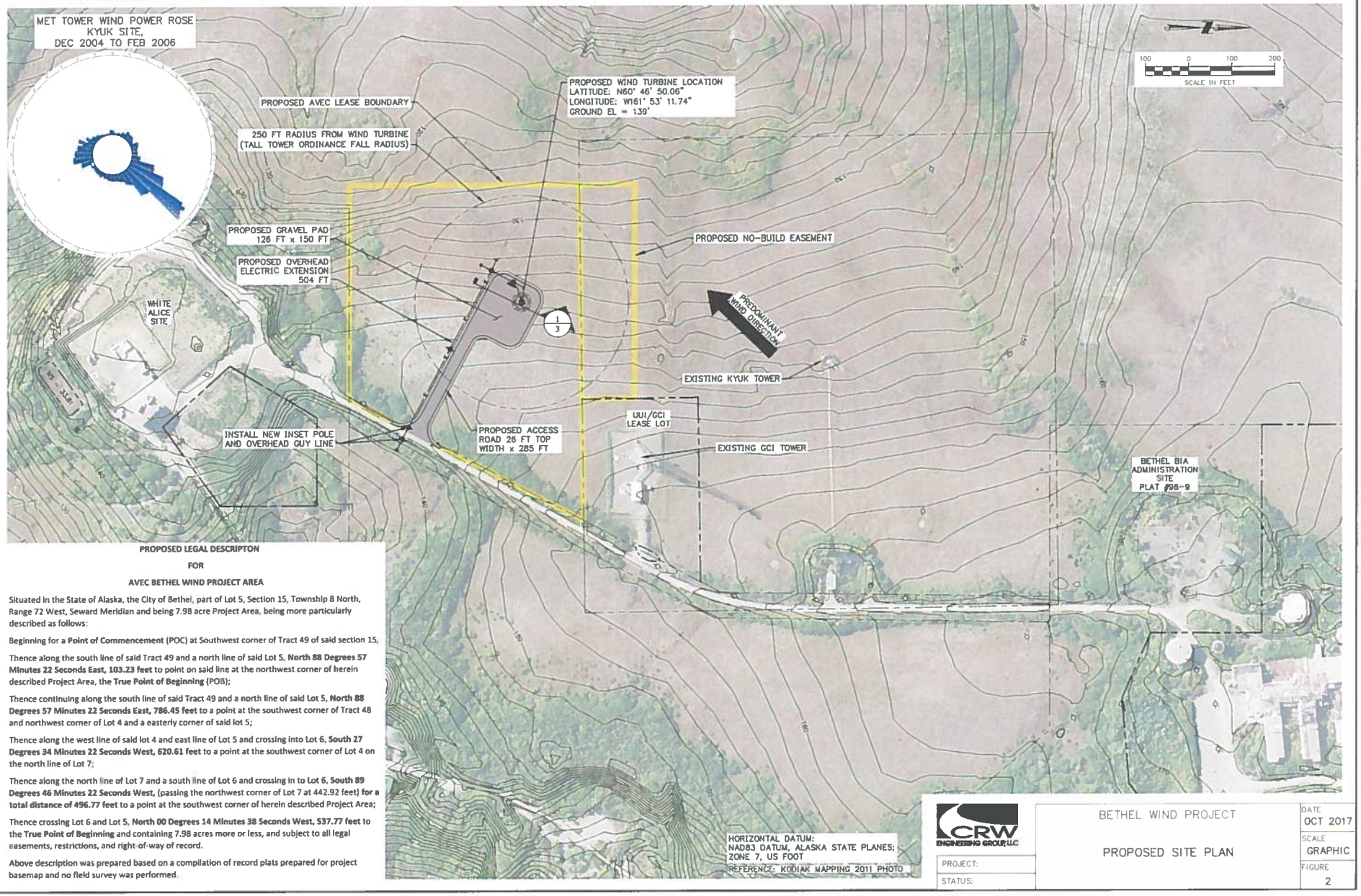
VICINITY MAP

DATE OCT 2017

SCALE GRAPHIC

FIGURE 1

File: \\crweng.com\Projects\JobsData\30704.16 AVEC - Bethel Wind Project\00 CADD\01 Working Set\02 Survey\12 Base Map\30704.16 Proposed Site Figure.dwg



PROPOSED LEGAL DESCRIPTON

FOR

AVEC BETHEL WIND PROJECT AREA

Situated in the State of Alaska, the City of Bethel, part of Lot 5, Section 15, Township 8 North, Range 72 West, Seward Meridian and being 7.98 acre Project Area, being more particularly described as follows:

Beginning for a **Point of Commencement** (POC) at Southwest corner of Tract 49 of said section 15,

Thence along the south line of said Tract 49 and a north line of said Lot 5, **North 88 Degrees 57 Minutes 22 Seconds East, 103.23 feet** to point on said line at the northwest corner of herein described Project Area, the **True Point of Beginning** (POB);

Thence continuing along the south line of said Tract 49 and a north line of said Lot 5, **North 88 Degrees 57 Minutes 22 Seconds East, 786.45 feet** to a point at the southwest corner of Tract 48 and northwest corner of Lot 4 and a easterly corner of said lot 5;

Thence along the west line of said lot 4 and east line of Lot 5 and crossing into Lot 6, **South 27 Degrees 34 Minutes 22 Seconds West, 620.61 feet** to a point at the southwest corner of Lot 4 on the north line of Lot 7;

Thence along the north line of Lot 7 and a south line of Lot 6 and crossing in to Lot 6, **South 89 Degrees 46 Minutes 22 Seconds West,** (passing the northwest corner of Lot 7 at 442.92 feet) **for a total distance of 496.77 feet** to a point at the southwest corner of herein described Project Area;

Thence crossing Lot 6 and Lot 5, **North 00 Degrees 14 Minutes 38 Seconds West, 537.77 feet** to the **True Point of Beginning** and containing 7.98 acres more or less, and subject to all legal easements, restrictions, and right-of-way of record.

Above description was prepared based on a compilation of record plats prepared for project basemap and no field survey was performed.

CRW ENGINEERING GROUP, LLC

PROJECT:

STATUS:

BETHEL WIND PROJECT

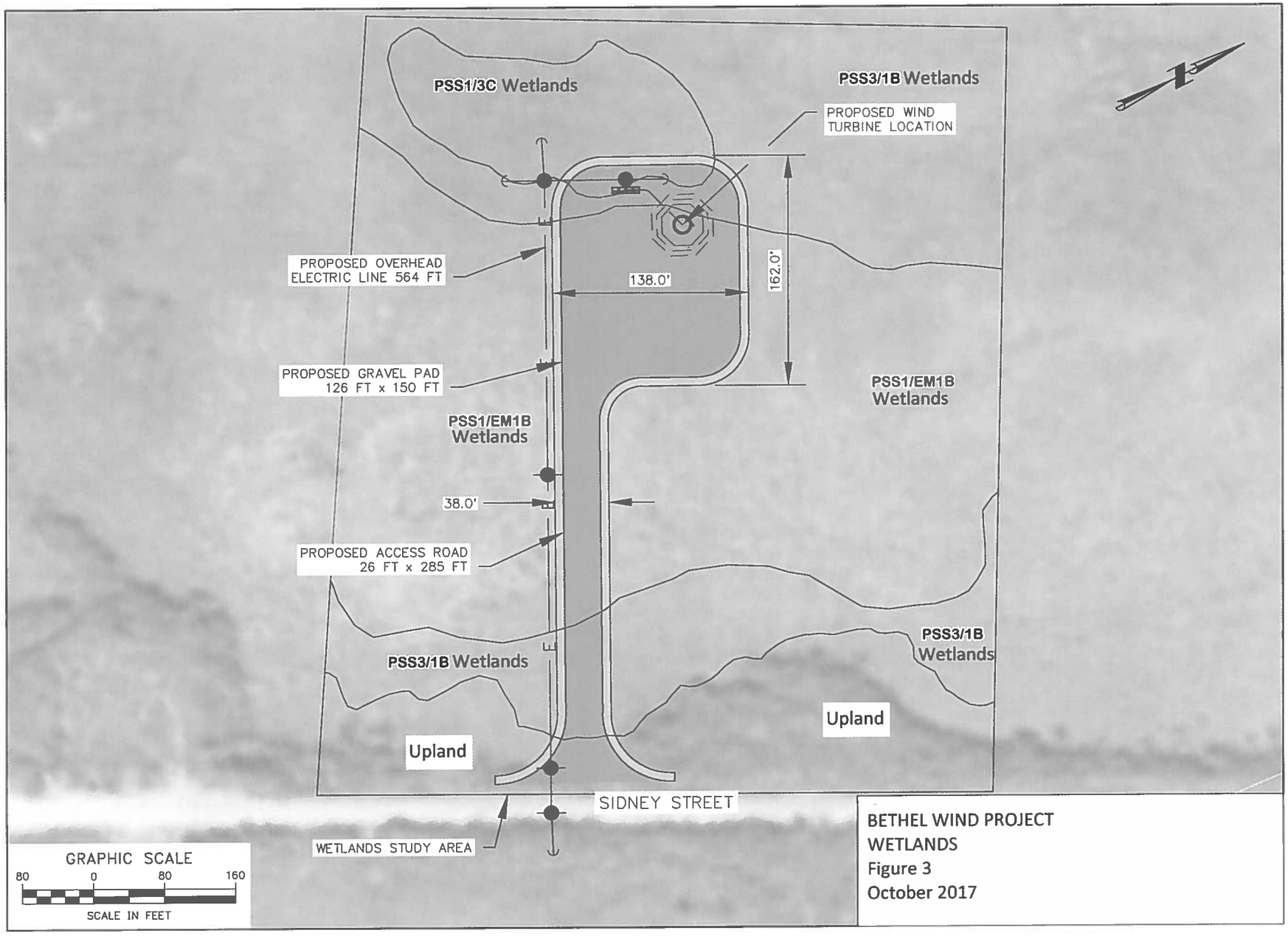
PROPOSED SITE PLAN

DATE: OCT 2017

SCALE: GRAPHIC

FIGURE: 2

File: J:\Jobs\Data\30704.16 AVEC - Bethel Wind Project\00 CADD\01 Working Set\02 Survey\12 Base Maps\30704.16 Proposed Site Figure.dwg



BETHEL WIND PROJECT
WETLANDS
Figure 3
October 2017

-----Original Message-----
From: Nelson, Chase
Sent: Wednesday, October 18, 2017 9:57 AM
To: McNulty, Michelle; Jenkins II, Gary
Cc: Hogins, Travis
Subject: RE: Bethel review

Hi, Michelle.

We did review the submittal. In general, we feel it is acceptable, but here are a few things to note. The designer noted most of these in some fashion.

-The proposed site development is outside of Bethel Municipal Boundaries, so the City has limited ability to control development here. As you are aware there is no Borough for this part of the State either, so there are no actual codes to check the plan against. Since this is outside the municipal boundaries, there are no set-backs to follow.
-The designer notes that there are no FEMA flood plain maps for this area. We can't verify that, but we note this location is relatively high ground at elevation=139'. So it is not likely to be impacted by flooding.
-This site plan is at a preliminary engineering level, not a fully developed design level. There are not details to examine on how the access road or site pad, or turbine foundation will be constructed.
-The designer appears to have all that is listed in the checklist, so we consider this submittal complete.

Thank you, Chase

Chase A. Nelson, P.E.
Civil Engineer

DOWL

7. DESIGN DESCRIPTION AND SPECIFICATIONS

Alaska Village Electric Cooperative, Inc.
Bethel Wind Project
October 2017 Special Use Permit
Public Hearing Application

DESIGN DESCRIPTION AND SPECIFICATIONS

Contents

Components and Design 1

Dimensions 1

Colors and Materials 1

Elevation Plans 2

Manufacturer Information 2

Appendices

A1. Wind Turbine Elevation View

A2. Emergya Wind Technologies DIRECTWIND 52/54 Specifications

Components and Design

This document provides a written explanation (below) and drawings (Appendices 1 and 2) to describe and depict the proposed Alaska Village Electric Cooperative (AVEC) Bethel Wind Project that would install an Emergya Wind Technologies (EWT) 50-meter (m) wind turbine.

For additional details regarding the proposed wind turbine see the Project Description.

Dimensions

- **Wind turbine height and blade clearance:** The turbine would be a total of 58-m or 190 feet (ft)) tall including blade clearance.
- **Maximum rotor diameter:** The rotor diameter would be 52-m or approximately 170 ft.
- **Accessory equipment:** The building pad and access road design are described in the Project Description and Proposed Site Plan.
- **Climb prevention:** The proposed project avoids a lattice design and is not easily climbable.

No concealment enclosures will be used for this project.

Colors and Materials

The turbine will use a white tower with orange stripes (as required by the Federal Aviation Administration), and the blades will be black. Red lighting will be affixed to the nacelle.

Elevation Plans

See the Proposed Elevation View for a depiction of how the Bethel Wind Project will be designed (Appendix 1). See also the Proposed Site Plan for a depiction of all proposed equipment overlaid with the existing land contours.

Manufacturer Information

See Appendix 2. Emergya Wind Technologies DIRECTWIND 52/54 Specifications for detailed depictions of a 50-m turbine including a typical site layout for a 50-m turbine as provided by the wind turbine manufacturer.

During the pre-application meeting with the City of Bethel, AVEC, and Solstice Alaska Consulting, Inc. (AVEC subconsultant) on July 28, 2017, the project team was told that samples of building materials are not needed for this project.

Bethel Wind Project
Design Description and Specifications
Appendices

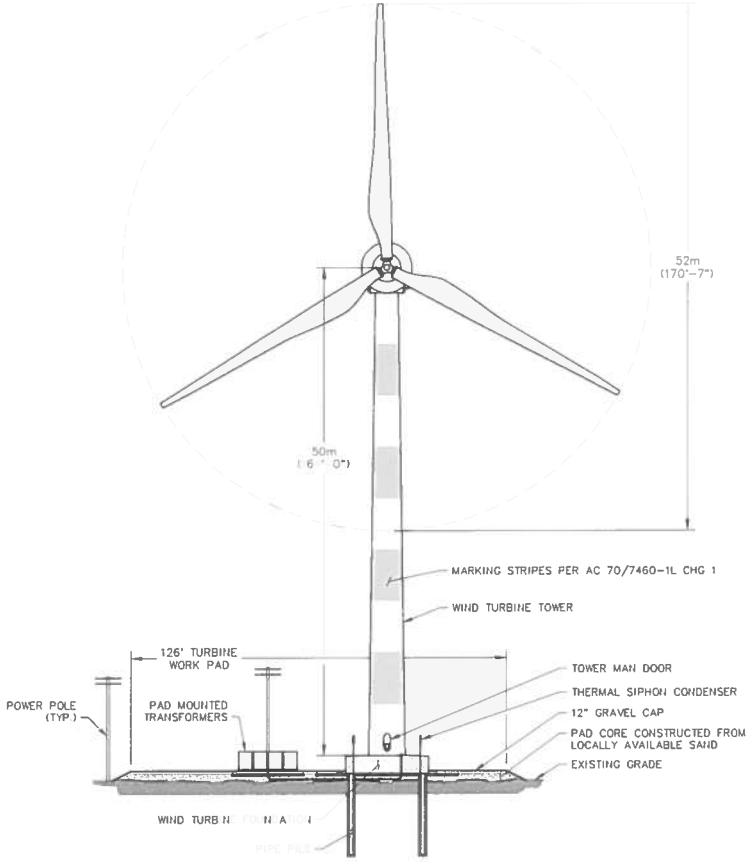
Contents

Appendix A. Wind Turbine Elevation View

Appendix B. Emergya Wind Technologies DIRECTWIND 52 Specifications

APPENDIX A.

Wind Turbine Elevation View



1 **WIND TURBINE ELEVATION VIEW**

20 0 20 40
SCALE IN FEET

PROJECT:	CRW ENGINEERING GROUP, LLC	BETHEL WIND PROJECT	DATE OCT 2017
STATUS:		WIND TURBINE ELEVATION	SCALE GRAPHIC

File: \\crweng.com\Projects\JobsData\30704.16 AVEC - Bethel Wind Project\00 CADD\02 Figures\03 Permitting\USACE\30704.16 Wind Turbine Elevation View.dwg

APPENDIX B.

Emergya Wind Technologies DIRECTWIND 52 Specifications

DSP - DIRECTWIND Service Program

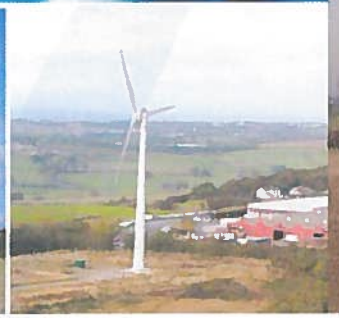
EWT stands for high-quality direct drive turbines characterised by reliability and cost efficiency. To ensure optimal performance and trouble-free operation of our DIRECTWIND turbines, we have an extensive service and maintenance program in place.

The DIRECTWIND Service Program offers:

- Preventive maintenance
- Power curve guarantee
- Corrective maintenance
- Extended product warranty
- Availability guarantee
- Business Interruption compensation

EWT's remote monitoring strength

All DIRECTWIND turbines that have been installed worldwide are monitored 24/7 from EWT's headquarters in Amersfoort, The Netherlands. Our highly experienced, professional staff, together with a modern and efficient control room and innovative turbine analysis software, contribute towards the high availability of our turbines.



DW52 900kW

EWT B.V.
Lindeboomseweg 51
3825 AL Amersfoort
The Netherlands

T +31 (0)33 454 05 20
sales@ewtdirectwind.com
www.ewtdirecwind.com

EWT UK Ltd.
Thistle Court
1-2 Thistle Street
Edinburgh
EH2 1DD
United Kingdom

T +44 (0) 131 560 16 61
salesUK@ewtdirectwind.com

EWT

MORE ENERGY
LESS COMPLEXITY

DW52 900kW

Direct drive technology for optimum reliability

EWT offers a highly efficient product range based on direct drive technology with a high yield and low cost of energy. The combination of proven direct drive technology and advanced control features makes EWT's DIRECTWIND a first-class choice with regard to energy yield and reliability.

In the DIRECTWIND turbines, the rotor directly drives the synchronous generator without the use of a gearbox. Eliminating the gearbox means that the number of rotating components is reduced and therefore, the wear and tear on the parts, leading to a lower maintenance need.

Perfect for weak grids and micro grids

Energy generated from the turbine is fed into the grid via a modern back-to-back full-power converter, which controls the power output. In addition, the turbine has a number of programmable functions, such as a capability to adjust the power factor and a capability to automatically control the voltage in order to comply with stringent grid requirements. This makes our turbine suitable to operate in weak grids and micro grids. The perfect choice for single wind turbine applications, and demanding locations where specific environmental demands must be met.

Technically suited to integration with other generation

The flexibility that the direct drive and back-to-back full-power converter technology offers, makes the turbine highly suited for integration with other generation sources such as hybrid wind/diesel power systems.

Focused on medium and low wind regimes

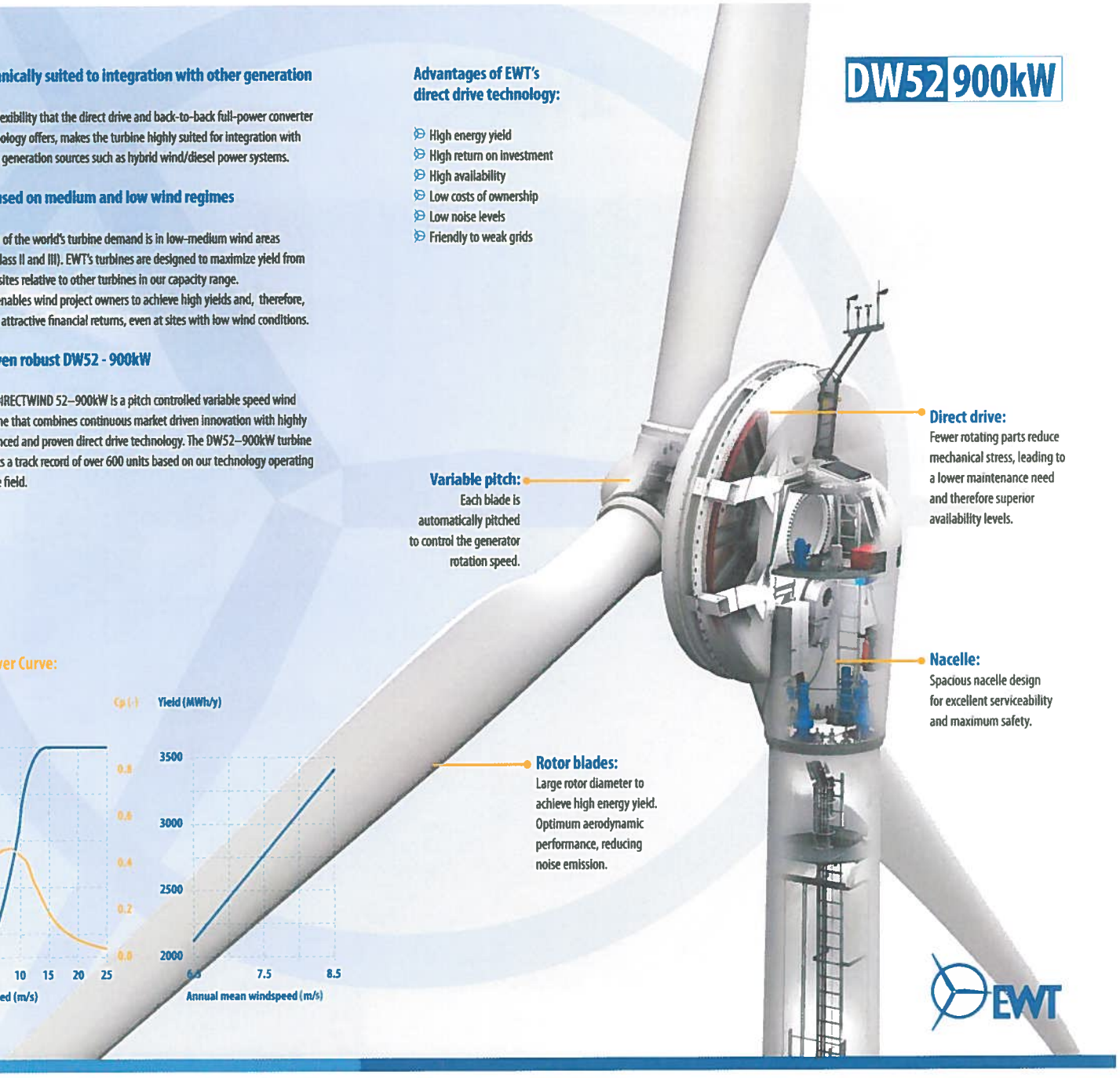
Much of the world's turbine demand is in low-medium wind areas (IEC class II and III). EWT's turbines are designed to maximize yield from such sites relative to other turbines in our capacity range.
This enables wind project owners to achieve high yields and, therefore, more attractive financial returns, even at sites with low wind conditions.

Proven robust DW52 - 900kW

The DIRECTWIND 52–900kW is a pitch controlled variable speed wind turbine that combines continuous market driven innovation with highly advanced and proven direct drive technology. The DW52–900kW turbine boasts a track record of over 600 units based on our technology operating in the field.

Advantages of EWT's direct drive technology:

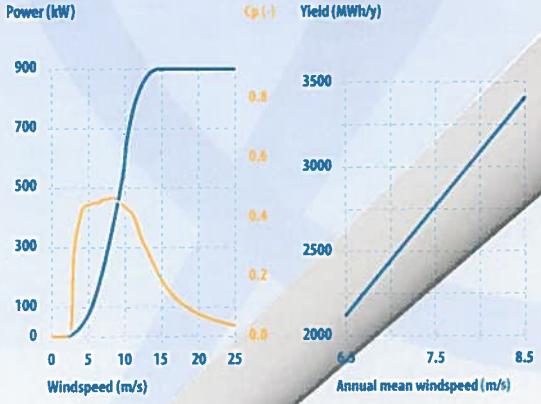
- High energy yield
- High return on investment
- High availability
- Low costs of ownership
- Low noise levels
- Friendly to weak grids



Specifications:

Rotor diameter:	52 m
IEC wind class:	IIA
Rotor speed variable:	12 - 26 rpm
Nominal power output:	900 kW
Hub heights:	35, 40 and 50 m
Cut-in wind speed:	2.5 m/s
Rated wind speed:	14 m/s
Cut-out wind speed:	25 m/s, 10 min. avg.
Survival wind speed:	59.5 m/s
Power output control:	Pitch controlled
Generator:	Synchronous multi-pole
Power converter:	IGBT-controlled

Power Curve:



EWT

8. DEMONSTRATED COMMITMENT TO ALLOW COLLOCATION

Alaska Village Electric Cooperative, Inc.
Bethel Wind Project
October 2017 Special Use Permit
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COLLOCATION – N/A

Collocation will not be pursued for the Bethel Wind Project; as written in the Letter of Intent project variances, as a wind turbine, collocation does not apply to this project.

9. EVIDENCE PROPOSED STRUCTURE WILL NOT INTERFERE WITH APPROACHES TO EXISTING AIRFIELD/AIRPORT

Alaska Village Electric Cooperative, Inc.
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PROPOSED STRUCTURE NON-INTERFERENCE WITH APPROACHES TO EXISTING AIRFIELD/AIRPORT

The Federal Aviation Administration (FAA) Determination of No Hazard to Air Navigation issued on September 29, 2017 for the Bethel Wind Project provides evidence from FAA that the proposed structure will not interfere with the approaches to existing airfields/airports.

See the Letter of Intent Appendix C for a copy of this Determination.

10. COMPLIANCE WITH MIGRATORY BIRD TREATY ACT

Alaska Village Electric Cooperative, Inc.
Bethel Wind Project
October 2017 Special Use Permit
Public Hearing Application

MIGRATORY BIRD TREATY ACT COMPLIANCE

Mitigation and Avoidance

Careful consideration was taken during Bethel Wind Project design to minimize and avoid environmental and wildlife impacts.

The Bethel Wind Project will avoid vegetative clearing, excavation, and placement of fill on or over functional bird habitat between May 5 and July 25, the U.S. Fish and Wildlife Service (USFWS) recommended time for land disturbance and vegetation clearing avoidance for a shrub or open environment in the Yukon-Kuskokwim Delta (USFWS 2017).[1]

Agency Review

The Bethel Wind Project complies with the Migratory Bird Treaty Act of 1918 (MBTA).

On August 2, 2017, an application for an Individual Permit for the Bethel Wind Project was submitted to the U.S. Army Corps of Engineers (USACE). During the application review process, the USACE circulated the application for consultation with relevant local and federal agencies, including the USFWS, the federal agency with statutory authority that is responsible for enforcing the Migratory Bird Treaty Act, Fish and Wildlife Improvement Act, and Fish and Wildlife Act. **The USFWS did not express concerns about bird impacts for this project.**

See the final issued USACE permit (# POA-2017-403, received October 17, 2017) provided in the Letter of Intent Appendix D.

---

[1]USFWS. 2017. Region 7. *Timing Recommendations for Land Disturbance & Vegetation Clearing.* June 2017.

11. CERTIFICATION(S) OF ENGINEERS

BBFM Engineers Inc.

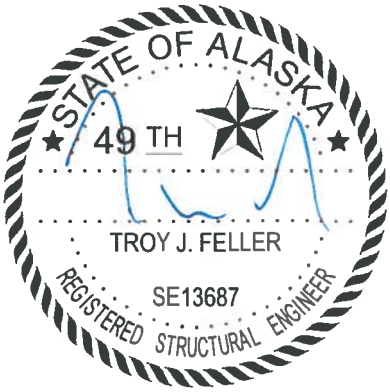
845 K Street
Anchorage, AK 99501
(907) 274-2236
(907) 274-2520 Fax
www.bbfm.com

Certificate of Engineer

Project: Alaska Village Electric Cooperative, Inc. Bethel Wind *EWT DW50-52* Project

I, Troy Feller, as a professional structural engineer licensed in the State of Alaska, do hereby attest that:

The foundation system for the proposed EWT DW50-52 wind turbine to be installed in Bethel, Alaska will be designed to meet the loading criteria provided by the wind turbine manufacturer and all applicable structural codes.



EWT	Emergya Wind Technologies B.V.
	*DIRECT**WIND*** DW52/54

EU Declaration of Conformity

SUPPLIER DETAILS

Supplier: Emergya Wind Technologies B.V. (registered number 34199007)
Lindeboomseweg 51, 3825 AL Amersfoort, The Netherlands
www.ewtdirectwind.com

PRODUCT DETAILS

Product: Wind Turbine Generator *DIRECT**WIND*** DW52/54
CE Marking year: First time 2006

TECHNICAL FILE

Maintained by: M.N. Jonkhof, Chief Technical Officer, Emergya Wind Technologies B.V.

DIRECTIVES

- Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC
- Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits
- Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility (recast)
- Directive 89/686/EEC of 21 December 1989 on the approximation of the laws of the Member States relating to personal protective equipment

STANDARDS

- IEC 61400-1: Wind turbines – Part 1: Design requirements
- IEC 60364: Low-voltage electrical installations
- IEC 61400-24: Wind turbines – Part 24: Lightning protection
- IEC 60204-1: Safety of machinery - Electrical equipment of machines - Part 1: General requirements
- ISO 13849: Safety of machinery - Safety-related parts of control systems - Part 1 General principles for design

DECLARATION

We hereby declare under the sole responsibility of Emergya Wind Technologies B.V. that the *DIRECT**WIND*** DW52/54 product as delivered complies with the abovementioned Directives and Standards:

Date:	22 December 2016		
Place:	Amersfoort		
Name:	M.R. Jones	Name:	R.J. Idema
Title:	Director (CEO)	Title:	Director (CFO)
Signature:		Signature:	

Type Certificate

TC – 151203, Rev. 1

This certificate is issued to

EWT Holdings N.V./EWT B.V.
Lindeboomseweg 51
3825 AL Amersfoort
The Netherlands

for the wind turbine

DIRECTWIND 52*900
Hub heights 35 m, 40 m and 50 m
Rotor Blade PMC24.5 / PMC25.0

This certificate attests compliance with

IEC 61400-1	"Wind turbine generator systems - Part 1: Safety requirements", Edition 2.0, 1999-02 Wind Turbine Generator System Class IIA

concerning the design and manufacture. It is based on the following reference documents:

STC – 090708	Design Evaluation Conformity Statement	DEWI-OCC, Rev. 4, 2016-06-13
STC – 100303	Manufacturing Conformity Statement	DEWI-OCC, Rev. 5, 2016-06-13
STC – 100302	Type Test Conformity Statement	DEWI-OCC, Rev. 4, 2016-06-13
R101482-12a	Final Evaluation Report	DEWI-OCC, Rev. 1, 2016-06-13

The conformity evaluation was carried out according to IEC WT 01, "IEC Systems for Conformity Testing and Certification of Wind Turbines, Rules and procedures", Edition 1.0, 2001-04.

Changes in the system design or the manufacturer's quality system are to be approved by DEWI-OCC. Without approval, this certificate loses its validity.

The wind turbine is specified in the annex of the conformity statement STC-090708 Rev.4, 2016-06-13.

This type certificate is valid until: 2021-06-12

Cuxhaven, 2016-06-13

Kai Grigutsch, M.Sc.
Head of DEWI-OCC
Certification Body for Wind Turbines

Certification Body for products accredited by DAkkS according to DIN EN ISO/IEC 17065:2013. The accreditation is valid for the fields of certification listed in the accreditation certificate

DAkkS Deutsche Akkreditierungsstelle D-ZE-11326-01-00

DEWI-OCC Offshore and Certification Centre GmbH
Am Seedeich 9, D-27472 Cuxhaven
www.dewi-occ.de

a UL company

12. EVIDENCE THE WIND TOWER IS DESIGNED AT THE MINIMUM HEIGHT NECESSARY

Alaska Village Electric Cooperative, Inc.
Bethel Wind Project
October 2017 Special Use Permit
Public Hearing Application

EVIDENCE THE WIND TOWER IS DESIGNED AT THE MINIMUM HEIGHT NECESSARY

The Bethel Wind Project proposed design meets the minimum height required for effective functioning of the proposed tower because: it provides sufficient energy output for Bethel and it is the approved wind turbine height by the Federal Aviation Administration (FAA) for this project.

1. Energy Output

A 50-meter (m) 900-kilowatt (kW) Turbine Would Provide Sufficient Energy Output for Bethel's Needs

The Emergya Wind Technologies (EWT) 50-meter (m) turbine is the right tower height for this project for Bethel medium to large scale energy production. It was selected for its energy output as defined in Table 1.

Table 1. Energy Production: 50-m Wind Turbine Hub

Turbine Hub Height	Wind Speed at Hub Height (m/s)	Net Power (kW)	Net AEP (kWh/year)	Net CF (%)
EWT DW52-900 50-m	7.55	297	2,604,197	33.0

According to the Alaska Energy Authority's Wind Resource Assessment for Bethel, a 50-m turbine subject to Bethel's local air density and wind speed distribution would have a 7.3 meters per second, long-term annual average wind speed, which is a Class 4 wind resource ("good for wind power development") (Appendix A2 of the Project Description).[1]

For additional details see the Project Description.

2. FAA Approval

A 50-m Turbine Is the FAA-Approved Allowable Turbine Height

For additional details, see the No Hazard to Air Navigation appended to the Letter of Intent (Appendix C of the Letter of Intent).

[1]Alaska Energy Authority. 2006. Wind Resource Assessment for Bethel, Alaska, p. 12. February 2006.

13. PUBLIC PARTICIPATION PLAN

Alaska Village Electric Cooperative, Inc.
Bethel Wind Project
October 2017 Special Use Permit
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PUBLIC PARTICIPATION PLAN

Contents

Introduction 1

Methods of Public Participation 1

Open-House Public Meeting 1

Nearby Property Owner Notification 2

Community Outreach 2

Methods for Documenting and Responding to Public Participation 3

Ongoing Communication throughout Project 3

Anticipated Project Schedule 3

TABLES

Table 1. Public Participation Methods and Tools for Community Outreach 2

Introduction

The Alaska Village Electric Cooperative, Inc. (AVEC), through the AVEC/Bethel Native Corporation Renewable Energy Joint Venture (ABRE) partnership, is planning the Bethel Wind Project and proposes to erect a 50-meter (m), 900-kilowatt (kW) wind turbine in Bethel, Alaska.

This document provides a Public Participation Plan, ensuring early and effective public participation so that Bethel citizens have an adequate opportunity to learn about the Bethel Wind Project, which is being planned in the best interest of the City of Bethel.

Methods of Public Participation

Open-House Public Meeting

This project will include an open-house-style public meeting to present the project and solicit comments from the public at the Yupiit Piciryarait Cultural Center in Bethel.

The open house meeting format would allow residents and stakeholders to engage with the project team. The project manager, project engineer, AVEC Public Liaison, and other members of the project team will be present.

Meeting materials presented will include the proposed project purpose, details, and schedule, and attendees will be encouraged to talk with the project team and submit written comments.

Nearby Property Owner Notification

To ensure that adjacent property owners are aware of the Bethel Wind Project, property owners would be identified, and mailers would be delivered via U.S. mail to alert them of the project, encourage ongoing communication and request input, and notify them of the opportunity to attend the public open house meeting.

Because the proposed project location is outside the City of Bethel zoned areas, and because there are no residences located with 1,200 feet of the proposed project site, the adjoining and nearest property owners will be identified using the best resources possible, including the Alaska Department of Natural Resources (ADNR) Recorder's Office property records.

Community Outreach

The following outreach for the Bethel area would be completed (Table 1).

Table 1. Bethel Wind Project Public Participation Methods and Tools for Community Outreach

Method of Communication	Proposed Entity/Tool to Reach the Bethel Area
Project letter/mailer	Adjoining or nearby property owners as identified through the ADNR Recorder's Office
Newspaper display advertisements	Newspaper articles through *Delta Discovery*
Radio public service announcement	Public broadcasts through KYUK Broadcasting
Television advertisement	Public broadcasts through the following channels: • KYUK Broadcasting
Community bulletin posters	Community bulletins at the following locations: • Alaska Commercial Store and AVEC Member Service Office • Alaska Commercial Quick Stop • Bethel Post Office • Bethel Public Library • Corina's Store • Swanson's Store and Swanson's Quick Stop • Sammy's Market • Video World

Methods for Documenting and Responding to Public Participation

All of the identified methods of communication above (Table 1) will include language that suggests that comments are welcome and may be submitted and expresses that there is an open line of communication between the project team and the public.

All comments will be documented in the Public Participation Report and provided to the City of Bethel. Feedback will be incorporated into the planning process, and the project team will weigh project comments in order for the project to meet the best interests of the City of Bethel and its residents.

Ongoing Communication throughout Project

Throughout the process, ongoing public comment and participation will be encouraged via telephone, email, and U.S. mail.

Public outreach will be emphasized prior to: project announcement, the public open house meeting, and project construction.

Anticipated Project Schedule

Project foundation construction is anticipated to begin Fall 2017. Additional construction including erecting the wind turbine is anticipated for the summer of 2018.

14. PUBLIC PARTICIPATION REPORT

CITIZEN PARTICIPATION FORM – PART A

This form must be completed and submitted with the applicant's completed Public Hearing Application. Applications submitted to the City of Bethel without a completed Citizen Participation Form – Part A, will not be accepted.

Public Hearing or Project Name: Bethel Wind Project

Contact Name: Forest Button Contact #: 907-561-1818

The following people will be notified of this application and provided information describing the subject proposal. Please note ALL adjoining property owners MUST be notified. Use additional pages as needed.

See the attached Bethel Wind Project Public Participation Report, which documents how nearby/adjoining property owners (Appendix A) as well as other members of the public were made aware of this project.

Method by which these individuals will be contacted. Please mark all that apply. If you select "Other," you must provide a description of the method of contact that will be used.

- [ ] Letter
- [ ] Personal Visits
- [ ] Telephone
- [ ] Group Meeting
- [ ] Email
- [x] Other: _____

Please describe the method(s) by which these individuals will have the opportunity to respond or contact the applicant with questions or concerns about the proposal.

Display advertisements were published in the Delta Discovery on July 26, 2017 and August 2, 2017. Mailers to nearby property owners were mailed out on August 2, 2017. Between August 14 and Augu 23, 2017 a radio Public Service Announcement (PSA) ran through KYUK. A television advertisement was also submitted to KYUK Broadcasting on August 1, 2017. Project posters were also posted on eleven community bulletin boards in Bethel.

For details see the Public Participation Report.

CITIZEN PARTICIPATION FORM – PART B

This form must be completed and submitted to the City of Bethel Planning Department a minimum of twenty (20) calendar days prior to the scheduled Public Hearing. Failure to do so will result in a cancelation of the scheduled hearing.

Public Hearing or Project Name: Bethel Wind Project

Contact Name: Forest Button Contact #: 907-561-1818

Please describe comments and concerns provided by any individuals contacted as part of the Citizen Participation Program. If any individuals provided written correspondence, please attach copies of same to this report.

No written or emailed comments were received. See the attached Public Participation Report for a summary of verbal comments (Appendix D) heard by the project team during the public open house.

Method by which these individuals were contacted. Please mark all that apply. Please provide samples of any and all written communications used to provide notification.

- ☐ Letter
- ☐ Personal Visits
- ☐ Telephone
- ☑ Group Meeting
- ☐ Email
- ☑ Other (*Please Specify*): *mailer, newspaper ads, radio ads, television ads, community bulletins, public open house meeting in Bethel on August 23, 2017.*

Attach a list of people who have been notified of this Application and provided information describing the subject proposal. Please note that ALL adjoining property owners MUST be notified.

See the attached Public Participation Report (Appendix D) for this list.

I, the undersigned, as an authorized representative of the applicant and Public Hearing item identified above, do solemnly swear and attest, subject to criminal penalties for perjury, that the information provided in this Citizen Participation Form – Part B and in any and all documents provided in support of this report are true and accurate. I further understand that any false statements provided by representatives of the applicant as part of this report may result in penalties up to and including denial of the subject application.

Signature of Authorized Agent: _____

Dated: 10/31/17

Print Form

CITIZEN PARTICIPATION FORM – PART B

This form must be completed and submitted to the City of Bethel Planning Department a minimum of twenty (20) calendar days prior to the scheduled Public Hearing. Failure to do so will result in a cancelation of the scheduled hearing.

Public Hearing or Project Name: Bethel Wind Project

Contact Name: Forest Button Contact #: 907-561-1818

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- ☐ Email
- ☑ Other (*Please Specify*): *mailer, newspaper ads, radio ads, television ads, community bulletins, public open house meeting in Bethel on August 23, 2017.*

Attach a list of people who have been notified of this Application and provided information describing the subject proposal. Please note that ALL adjoining property owners MUST be notified. *See the attached Public Participation Report (Appendix D) for this list.*

I, the undersigned, as an authorized representative of the applicant and Public Hearing item identified above, do solemnly swear and attest, subject to criminal penalties for perjury, that the information provided in this Citizen Participation Form – Part B and in any and all documents provided in support of this report are true and accurate. I further understand that any false statements provided by representatives of the applicant as part of this report may result in penalties up to and including denial of the subject application.

Signature of Authorized Agent: _____

Dated: 10/31/17

Print Form

Alaska Village Electric Cooperative, Inc.
Bethel Wind Project
October 2017 Special Use Permit
Public Hearing Application

PUBLIC PARTICIPATION REPORT

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Appendix A. Nearest Property Owners Contacted
Appendix B. Public Participation Outreach Materials
Appendix C. Public Open House Meeting Materials
Appendix D. Public Open House Meeting Verbal Public Comments

Introduction

The Alaska Village Electric Cooperative, Inc. (AVEC), through the AVEC/Bethel Native Corporation Renewable Energy Joint Venture (ABRE) partnership, has initiated the Bethel Wind Project and proposes to erect a 50-meter (m), 900-kilowatt (kW) wind turbine in Bethel, Alaska.

This report presents Bethel Wind Project public participation and other relevant background information, documents Bethel Wind Project public outreach, participation, and feedback, and meets the requirements of Bethel Municipal Code, as stipulated in Ordinance #15-27, section 16.10.090 pre-application requirements, subsection 9.

Methods of Public Participation

An open-house-style public meeting to present the project and solicit comments from the public was held on August 23, 2017 from 5:30 p.m. to 7:30 p.m. at the Yupiit Piciryarait Cultural Center in Bethel (as required by Ord. 15-27, 16.10.090 § 9a). Images 1 through 3 show the public open house meeting format. Meeting materials that were presented included the proposed project purpose, details, schedule, and attendees were encouraged to submit comments.

Images 1-3. Bethel Wind Project public open house meeting at the Yupiit Piciryarait Cultural Center on August 23, 2017.

In advance of the public meeting, the following outreach for the Bethel area was completed (Appendix B). To ensure that adjacent property owners of adjoining and nearby properties were aware of this project, mailers were delivered to nine property owners[1] as identified in Table 1 (Appendix A), postmarked on August 2, 2017. Display advertisements were published in the *Delta Discovery* on July 26, 2017 and August 2, 2017. Between August 14 and August 23, 2017, a radio public service announcement was broadcast through KYUK Broadcasting, and television advertisements were submitted to KYUK Broadcasting. Project posters were hung on ten community bulletin boards in Bethel (as required by Ord. 15-27, 16.10.090 § 9b). Bulletin locations included the Bethel Public Library; Alaska Commercial Store and the AVEC Member Service Office located within the store; Alaska Commercial Quick Stop; Swanson's Store; Swanson's Quick Stop; Sammy's Market; Corina's Store; Video World; and the Bethel Post Office.

With each method of outreach, comments were solicited via mail, email, or telephone; no written comments were received.

[1]Because there are no residences that are identifiable within 1,200 feet of the project area, mailers were sent to all property owners that may be nearest to the proposed project location.

Table 1. Bethel Wind Project: Nearest Property Owners Contacted by Mail
The following entities were identified as property owners, lessees, or have been granted easements within or near the project location and received a Bethel Wind Project mailer, postmarked on August 23, 2017.

Entity	Address
Bethel Broadcasting, Inc. and KYUK	P.O. Box 468 Bethel, AK 99559
Bethel Native Corporation	P.O. Box 719 Bethel, AK 99559
Bethel Utilities Corporation	3380 C Street, Ste. 210 Anchorage, AK 99503
Calista Corporation	5015 Business Park Blvd., Ste. 3000 Anchorage, AK 99503
City of Bethel	P.O. Box 1388 Bethel, AK 99559
Unicom, Inc. (United Utilities, Inc. and United KUC, Inc.)	5450 A Street Anchorage, AK 99518-1291
United States Air Force	21685 2nd Street Joint Base Elmendorf-Richardson, AK 99505
Yukon Delta National Wildlife Refuge	P.O. Box 346 Bethel, AK 99559
Bureau of Indian Affairs	Anchorage Agency 3601 C Street Suite 1100 Anchorage, AK 99503-5947

More than thirty-three people attended the August 23, 2017 public open house meeting. Thirty-three people signed in (Appendix C) (as required by Ord. 15-27, 16.10.090 § 9c and e). Attendees had the opportunity to submit comments verbally and in writing during the meeting or after the meeting. No written comments or inquiries were received before, during, or after the meeting (as required by Ord. 15-27, 16.10.090 § 9d and f).

Comments Received and How They Will Be Addressed

The project team fielded and actively addressed a variety of verbal questions and comments from the public during the August 23, 2017 public open house meeting. The responses from the public generally expressed support and excitement for the project after receiving information from the project team (Appendix D).

The comments and questions as verbalized on August 23, 2017 are summarized in Table 2.

Table 2. Public Participation Verbal Comment Summary ***(as required by Ord. 15-27, 16.10.090 § 9h)***

Comments Regarding the Proposed Site	*AVEC Response/How Comment Will Be Addressed*
• Does a wind turbine already exist in that area?	• No. The closest existing tower structures are the KYUK and GCI towers. The photo simulations presented at the meeting were reviewed.
• The proposed site would not have any visual impacts due to its isolation.	• Feedback noted.

Comments Regarding the Proposed Site (continued)	*AVEC Response/How Comment Will Be Addressed (continued)*
• The landfill/lagoon is still a viable site option.	• This location was dismissed from consideration due to the U.S. Fish and Wildlife (USFWS) determination that birds remain in the area year-round. This site's proximity to schools and residences also created substantial visual impacts.
• Will residents in the Kasayuli Subdivision be able to see the turbine?	• Yes. Residents will be able to see the turbine but visibility will be minimal.
Comments Regarding the Proposed Turbine	***AVEC Response/How Comment Will Be Addressed***
• What is the height of the wind turbine?	• The preferred alternative could stand up to 75-m or 246 feet tall. At the time of the public meeting, a 75-m turbine was the preferred alternative. Because this turbine height does not meet approval of the Federal Aviation Administration, a 50-m turbine is now proposed.
• How much power would the turbine produce and how will the cost of electricity be affected?	• The turbine could produce about 2,600 kilowatt hours per year, saving about $18 million over 20 years. Because of Alaska's Power Cost Equalization Program, residents would not see direct savings but would benefit from stabilized and lowered costs over time.
• Will there be audible noise pollution in the surrounding residential areas as a result of the turbine?	• No. This is not anticipated.
• Does the design plan contain a way to heat the turbine during the winter months?	• No. The black color of the turbine blades will be sufficient for de-icing during winter months.
• What type of foundation will the wind turbine have?	• It will have a driven-pile foundation with thermosyphons used to keep permafrost frozen.
• What houses will receive the power produced by the turbine?	• The power will be put into the distribution grid so all houses and businesses will benefit.
• Will this wind turbine be the same size as the one near the fitness center?	• No, it will be taller and will produce more energy.
• Will this wind turbine be more reliable than the one located near the fitness center?	• AVEC will be responsible and dedicated to its operation and maintenance to ensure it is always in the best condition to operate.
Other Comments/Questions	***AVEC Response/How Comment Will Be Addressed***
• Will the Federal Aviation Administration (FAA) be a barrier that will prevent the completion of the project?	• AVEC is coordinating with the FAA to ensure the turbine will not interfere with air navigation.
• The USFWS needs to leave the residents of Bethel alone.	• Feedback noted.
• Expressed general support for the project.	• Feedback noted.

Other Comments/Questions (continued)	*AVEC Response/How Comment Will Be Addressed (continued)*
• What permits are required for the project?	• A U.S. Army Corps of Engineers wetlands permit and City of Bethel approval (per the Tall Tower Ordinance) are required.
• When will the turbine be installed?	• AVEC hopes to begin construction on the foundation this fall (of 2017) and erect the turbine next summer (of 2018).

Bethel Wind Project
Public Participation Report Appendices

Contents

Appendix A. Nearest Property Owners Contacted

1. Mailer and Recipients

Apppendix B. Public Participation Outreach Materials

1. Newspaper Advertisement and Newspaper Affidavit of Publication
2. KYUK Public Radio Announcement
3. Community Flyer and Locations Posted
4. KYUK TV Announcement

Appendix C. Public Open House Meeting Materials

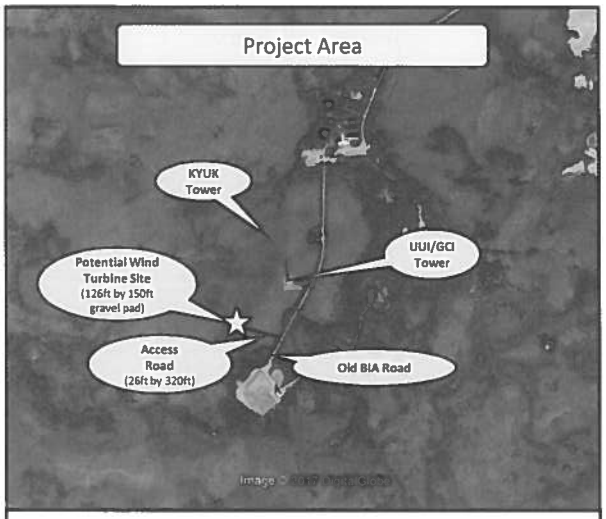
1. Meeting Overview
2. Sign-In Sheet
3. Materials Presented

Appendix D. Public Open House Meeting Verbal Public Comments

APPENDIX A.
NEAREST PROPERTY OWNERS CONTACTED

1. Mailer and Recipients

Front of Mailer



Alaska Village Electric Cooperative/
Bethel Native Corporation
Bethel Wind Project

AVEC Bethel

Alaska Village Electric Cooperative and Bethel Native Corporation

c/o Solstice Alaska Consulting, Inc.
2607 Fairbanks Street, Suite B
Anchorage, Alaska 99503

PRSRT STD
US Postage
PAID
Anchorage, AK
Permit #

To:

(see other side of the postcard for open house meeting details)

Back of Mailer

Wednesday, AUGUST 23 PUBLIC OPEN HOUSE

Bethel Wind Project

AVEC, in partnership with Bethel Native Corporation is planning to install a wind turbine in Bethel. This new power source would add 2,370 MWh of energy annually to the existing energy systems serving Bethel, Oscarville, and Napakiak.

Project Area

The wind turbine would be installed and maintained on Bethel Native Corporation lands off the Old BIA Road just south of the UUI/GCI tower.

Wind Turbine

The proposed wind turbine is an Emergya Wind Technologies DIRECTWIND 75-meter, 900 kW wind turbine with a traditional horizontal axis-design

DETAILS

AVEC Bethel

WHAT: **PUBLIC OPEN HOUSE**

WHEN: **Wednesday, August 23, 2017**
between 5:30 pm to 7:30 pm
It's an open house, so STOP BY any time!

WHERE: **Yupiit Piciryarait Cultural Center**
420 Chief Eddie Hoffman Highway, Bethel, AK

Come to an open house to:

- Learn about project improvements, including:
  - Energy benefits
  - Project design
  - Project area
  - Wind turbine specifics
  - Maintenance post-project completion
- Receive an update on project progress-to-date.
- Review the schedule and hear about project next steps.

QUESTIONS? For more information, attend the open house or contact:

- **Anna Sattler,** Community Liaison
  asattler@avec.org | 907.561.7972

Bethel Wind Project: Nearest Local Property Owners

The following organizations/entities received a Bethel Wind Project mailer, postmarked on August 23, 2017.

Organization	Address	Address Line 2
Bethel Broadcasting, Inc. and KYUK	P.O. Box 468	Bethel, AK 99559
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City of Bethel	P.O. Box 1388	Bethel, AK 99559
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United States Air Force	21685 2nd Street	Joint Base Elmendorf-Richardson, AK 99505
Yukon Delta National Wildlife Refuge	P.O. Box 346	Bethel, AK 99559
Bureau of Indian Affairs (BIA)	Anchorage Agency 3601 C Street Suite 1100	Anchorage, AK 99503-5947

APPENDIX B.
PUBLIC PARTICIPATION OUTREACH MATERIALS

1. Newspaper Advertisement and Newspaper Affidavit of Publication
2. KYUK Public Radio Announcement
3. Community Flyer and Locations Posted
4. KYUK TV Announcement

Lamp Unto My Feet

Contains less than 2% of the following ingredients: faith

by Tad Lindley

What do you think is the greatest miracle in the Bible? When we contemplate the mighty things that we read about in the Bible, many things come into our mind. There is Noah who gave up at least 100 years of his life to build the ark, and Moses who confronted the mighty Pharaoh of Egypt with nothing but a stick in his hand and God at his back. We might recall Jonah who preached so effectively that an entire city was brought to repentance. There was Elijah who prayed and fire came down from heaven. Peter grabbed the hand of a crippled man and he got up and walked. Four friends lowered a paralyzed man through the roof of a house and Jesus healed him. I could go on for several years of this column just listing miracles.

One thing in common

All of these miracles involved faith mixed with the word of God. Faith is essential. *But without faith it is impossible to please him: for he that cometh to God must believe that he is, and that he is a rewarder of them that diligently seek him.* (Hebrews 11:6) Of course you knew that faith was essential, but how much faith do we need?

Let us dissect a famous miracle and see how much faith it actually took. In Exodus 14, the Israelites were about to be destroyed by the Egyptian army. The Lord told Moses, *"...lift thou up thy rod, and stretch out thine hand over the sea, and divide it: and the children of Israel shall go on dry ground through the midst of the sea."*(Exodus 14:16) Moses followed directions, and the miracle came to pass. When the Egyptians followed, the waters closed over them and they drowned.

It wasn't really about Moses

We might think, that Moses had prayed long enough that God granted him this miracle, or that he had gone so long without eating meat, that God decided to give him a miracle. Wrong. All that Moses did was show up, mix his faith with the word of God, and see the miracle. Moses faith consisted of raising up his walking stick and raising his hand over the water, that's it (you or I could have done it). As with any miracle, the human being has very little to do with it. Miracles are about Jesus not about us. Without the man, the miracle wouldn't have happened, but all that the man did was mix in a very tiny amount of faith, and the Lord did the rest. If Moses had gone back to his tent to suck his thumb, the miracle would not have taken place, but instead, he believed the word of God, and mixed his faith with it.

Less than 2%

Have you ever read the ingredients on food labels? The ingredients are listed in order from most to least. Sugar and salt are often at the front of the list. At the end of the list there is often a phrase that read, "Contains less than 2% of the following ingredients". If there was a list of ingredients on miracles, this is where faith would fall: less than 2%. If you think I am wrong, you are trusting in humanity and not in God.

Do you have enough faith?

...faith comes from hearing the message, and the message is heard through the word of Christ. (Romans 10:17 NIV) If you have heard the word of God, then you have held faith. If you allow that faith to mix with the word of God, then you are moving in the right direction. *For unto us was the gospel preached, as well as unto them: but the word preached did not profit them, not being mixed with faith in them that heard it.* (Hebrews 4:2) That's good, but how much faith is enough to see the power of God?

Do you believe Genesis chapter 1? *Through faith we understand that the worlds were framed by the word of God, so that things which are seen were not made of things which do appear.* (Hebrews 11:3) If we believe that God created the heavens and the earth, and everything that follows, then we have enough faith to get started with the Lord. *Jesus said unto them, "... If ye have faith as a grain of mustard seed, ye shall say unto this mountain, Remove hence to yonder place; and it shall remove; and nothing shall be impossible unto you".* (Matthew 17:20) Jesus is always the main ingredient to a miracle, but when a human being meets Jesus with less than 2% faith nothing can stop him.

Tad Lindley is a minister at the United Pentecostal Church in Bethel, AK.

In Loving Memory

Kobe Jason Paul

March 18, 2000 – June 26, 2017

Kobe Jason "Lugiiq" Paul was born to Byron and Leona on March 18, 2000 in Bethel, AK. Kobe has 2 older brothers, Christian and Brandon, a younger brother Colton, and a younger sister Naidene.

When he was of age Kobe attended the Chief Paul Memorial School kindergarten to 3rd, then from 3rd – 5th attended Seward Elementary School. He finished his remaining school years up until 10th grade at the Chief Paul Memorial School.

Kobe loved participating in subsistence activities from hunting and fishing to gathering greens and berries. He was his family's "nukalpiaq" and with his brother and ap'a, never let the freezers go empty.

Kobe valued his heritage language; he would speak Yugtun as often as he could. And this young hunter immersed himself as best as he could in the traditional Yup'ik Eskimo culture through wood carving, making subsistence tools, and respecting and honoring the old Yup'ik ways and beliefs.

Kobe had many friends that he loved to play basketball and participate in NYO with. He was always pushing his friends to do better. Kobe was never shy, always striking up a conversation so that it wasn't awkward. He was always having fun with his friends and making them laugh or smile.

Byron and Leona Paul and family would like to thank everyone for the food and other donations that were given to our family in this time of sorrow. If we missed anyone we are sorry and apologize. Quyana.

The family would like to thank VPSOs Lloyd Frederickson and Paulson Paul, George & Anna Chuckwuk, Ralph & Shirley Fox, Andrew & Maureen Dock, Norman & Carol Anaver, Patricia Chadwick, Elizabeth Smith, Naidene Baechler, Sophia Kruschke, Jolene John, Peter & Anna Lincoln, Vivian Andrews, Mary Feagle, Garrett Paul, Lynda Paul, Willie John, Howard & Maxine Paul, Roy & Margene Paul, Slyvia Mann, Sheila Carl, CVRF, Kugkaktlik Limited, RAVN Air, and NSB Heritage.

Pallbearers: Christian Paul, Brandon Paul, Roy Paul, Daron Paul, Kenyon Paul, P. Garrett Paul, Phillip Kiunya, Clinton Dock, Ralph Fox, Dennis Chuckwuk, Eddie Chuckwuk, Colby Feagle, Chris Feagle, and Bruce Simons.

Honorary Pallbearers: Joshua Paul, Johnny Paul, Paul Paul, George Chuckwuk, Peter Lincoln, Bill Feagle Sr., John Jay Tretikoff, Norman Tretikoff, and James Sipary Sr.

PUBLIC OPEN HOUSE MEETING

The Alaska Village Electric Cooperative, Inc. (AVEC), in partnership with Bethel Native Corporation (BNC), is planning to install a 75-meter, 900 kW wind turbine in Bethel. The wind turbine would be installed and maintained on BNC lands off the Old BIA Road just south of the UUI/GCI tower. This new power source would add 2,370 MWh of energy annually to the existing energy systems serving Bethel, Oscarville, and Napakiak.

Please join our project team to learn more about the project, view the project plans, and provide feedback. An open house meeting will be held at the Yupiit Piciryarait Cultural Center located at 420 Chief Eddie Hoffman Hwy. on Wednesday, August 23, 2017 from 5:30 pm to 7:30 pm. Come anytime during the scheduled hours. For more information, contact Anna Sattler, AVEC Community Liaison at 907.561.7972 or asattler@avec.org.

Memories of Fishcamp

by Peter Twitchell

When times are good and when times are hard, fish camp is a wonderful place to spend time with the family. When fish camping, everyone is working together for a common cause; kids are fishing off their boat when its parked in the slough with parents supervising.

Waten Umyuaqutaqa
("What I think about it.")

The whitefish, Dolly Varden, Rainbows, are plentiful and can be eaten and enjoyed by the whole family (fish and chips). While celebrating your catch you also feel good about helping feed your Elders.

Mom and dad and the older kids are cutting fish, soaking it in brine and hanging it to dry. Then you take the dried fish and put it in the smokehouse to cure, usually with alder or cottonwood.

Some of the trees have aspirin-like quality in their sap and beneficial, I believe, in the smoked fish.

When I was a kid at fish camp I liked to help cut smoke wood, tend to the smokehouse, and make sure the smudge didn't lose its spark.

The longer you smoked the fish during the day, the quicker you got done with it, and begin storing it for the winter. Mom and dad stored their dried fish in wooden barrels.

Most fish campers are tending to and watching their dried fish like hawks, to keep it away from those who would come in after you've gone back home to Bethel, then help themselves to it. In modern times, people don't have the same respect people did two hundred years ago until the latter part of the 1950s. People really lived, breathed and practiced respect for their neighbors.

Meal times at fishcamp was a meal worth waiting for, usually consisting of the catch of the day with fresh vegetables, homemade bread with real butter and homemade preserves from the summer before.

Hot tea was good with a little candy made from rich brown sugar with some molasses cooked and hardened together.

One of the staples at fishcamp used to be fresh dried smoked salmon right out of the smokehouse. After a hot or not so hot steam it was time for bed. Off in the distance I could hear a boatload of fish campers returning home, and we'd wake up to the sound of birds chirping in the morning.

I relived these moments as I ate strips, with homemade bread with sweet butter and preserves made a few months earlier, and I'd top that off with sweet salmon-black berry akutaq sometimes with raisins. Then I'd wash all that down with hot tea. All of this was made possible by our family unit working together with no complaints.

Kwinhagak clean up yields benefits for community

It's Clean Up Green Up in the beautiful coastal village of Quinhagak this summer. Here kids work together to keep their village nice and trash-free.

by Stephan Jones

The Native Village of Kwinhagak Environmental Department's Annual Spring Clean-up was from May 30-June 1st. This year 154 participants picked 1,646 full yellow ALPAR bags and 535 miscellaneous/large items; 2,181 altogether for a grand total of $3,827 paid in 2017. It is a 28.8% increase in trash volume compared to 2016. This event wouldn't be possible without the generous donations from Coastal Villages Region Fund, Native Village of Kwinhagak Charitable Gaming, the City of Kwinhagak, Grant Aviation, Donlin Gold, Qanirtuuq, Incorporated, CRW Engineering, REEL Action Fly Fishing, Duncan and Son's. ltd., Jurgensmeyer's Northern Exposure LLC, AVEC, Yarek Nibursky and North Star Gas, AVCP and ALPAR. Thank you all very much for your support, we really appreciate it.

Stephan Jones is the Environmental Specialist for the Native Village of Kwinhagak.

Review of Bearded Seal ESA Listing requested

The State of Alaska today (July 21, 2017) joined a petition for writ of certiorari seeking U.S. Supreme Court review of a Ninth Circuit Court of Appeals order concerning the listing of bearded seals under the Endangered Species Act.

"A listing of a bountiful and healthy species solely upon uncertain speculation 100-years into the future is not scientific and would greatly impact our entire state," said Attorney General Jahna Lindemuth. "I hope the U.S. Supreme Court will take up this case and require that these decisions are supported by reasonable scientific evidence, not speculation."

The U.S. District Court initially found the Beringia distinct population segment of bearded seals should not have been listed as threatened because the seal population is presently healthy and does not face an immediate threat. The district court determined that the National Marine Fisheries Service should not have listed the species based solely upon speculation that the seals would be impacted by sea-ice habitat loss due to climate change by the end of the 21st century. NMFS needed to better explain and provide support for any potential impacts to the species, a species now robust in number and health. In October 2016, the Ninth Circuit disagreed with the district court, reinstating the listing. The Iñupiat Community of the Arctic Slope, Northwest Arctic Borough, North Slope Borough, Arctic Slope Regional Corporation, NANA Regional Corporation, Inc., and the State have joined together to ask the U.S. Supreme Court to review the case.

Buying a home?

Ask me about the HUD 184 home loan for Alaska Natives and American Indians

Lisa Makoni
NMLS #203684
Sr. Mortgage Loan Originator
907-261-3455 direct
907-952-3141 mobile
800-737-3033 ext. 3455
l.makoni@alaskausamortgage.com
www.lisamakoni.com

AlaskaUSA Mortgage Company
People you know. A name you trust.
License #AK157293

PUBLIC OPEN HOUSE MEETING

The Alaska Village Electric Cooperative, Inc. (AVEC), in partnership with Bethel Native Corporation (BNC), is planning to install a 75-meter, 900 kW wind turbine in Bethel. The wind turbine would be installed and maintained on BNC lands off the Old BIA Road just south of the UUI/GCI tower. This new power source would add 2,370 MWh of energy annually to the existing energy systems serving Bethel, Oscarville, and Napakiak.

Please join our project team to learn more about the project, view the project plans, and provide feedback. An open house meeting will be held at the Yupiit Piciryarait Cultural Center located at 420 Chief Eddie Hoffman Hwy. on Wednesday, August 23, 2017 from 5:30 pm to 7:30 pm. Come anytime during the scheduled hours. For more information, contact Anna Sattler, AVEC Community Liaison at 907.561.7972 or asattler@avec.org.

THE DELTA DISCOVERY NEWSPAPER
P.O. BOX 1028
BETHEL, AK 99559

AO/PO#_____
CASE NO. _____

Solstice Alaska Consulting, Inc.
NAME OF PETITIONER
2607 Fairbanks Street, Suite B
Anchorage, AK 99503
ADDRESS OF PETITIONER

For: AVEC/BNC
Bethel Wind Public
Open House Meeting

AFFIDAVIT OF PUBLICATION

UNITED STATES OF AMERICA, STATE OF ALASKA, 4th DIVISION, BEFORE ME, THE UNDERSIGNED, A NOTARY PUBLIC THIS DAY PERSONALLY APPEARED, Kelly J. Lincoln, WHO, BEING FIRST DULY SWORN, ACCORDING TO LAW, SAYS THAT SHE IS THE Office Manager OF THE DELTA DISCOVERY NEWSPAPER, PUBLISHED IN BETHEL IN SAID DIVISION 4th AND STATE OF ALASKA AND THAT THE ADVERTISEMENT, OF WHICH THE ANNEXED IS A TRUE COPY, WAS PUBLISHED IN SAID PUBLICATION ON 7/26/17 AND THEREFORE FOR A TOTAL OF 2 CONSECUTIVE ISSUE(S). THE LAST PUBLICATION APPEARING ON 8/2/17 AND THAT THE RATE CHARGED THEREON IS NOT IN EXCESS OF THE RATE CHARGED TO PRIVATE INDIVIDUALS.

Kelly J. Lincoln
KELLY JEAN LINCOLN
OFFICE MANAGER,
THE DELTA DISCOVERY NEWSPAPER

SWORN TO ME BEFORE ON Aug 16th, 17

Notary Public
E. TINKER
State of Alaska
My Commission Expires July 13, 2019

E Tinker
SIGNATURE OF NOTARY

Erma Tinker
PRINTED NAME OF NOTARY

MY COMMISSION EXPIRES ON July 13th, 19

Radio PSA for AVEC: Bethel Wind Farm Project

The Alaska Village Electric Cooperative, Inc. (AVEC), in partnership with Bethel Native Corporation (BNC), is planning to install a 75-meter, 900 kW wind turbine in Bethel. The wind turbine would be installed and maintained on BNC lands off the Old BIA Road just south of the UUI/GCI tower. This new power source would add 2,370 MWh of energy annually to the existing energy systems serving Bethel, Oscarville, and Napakiak.

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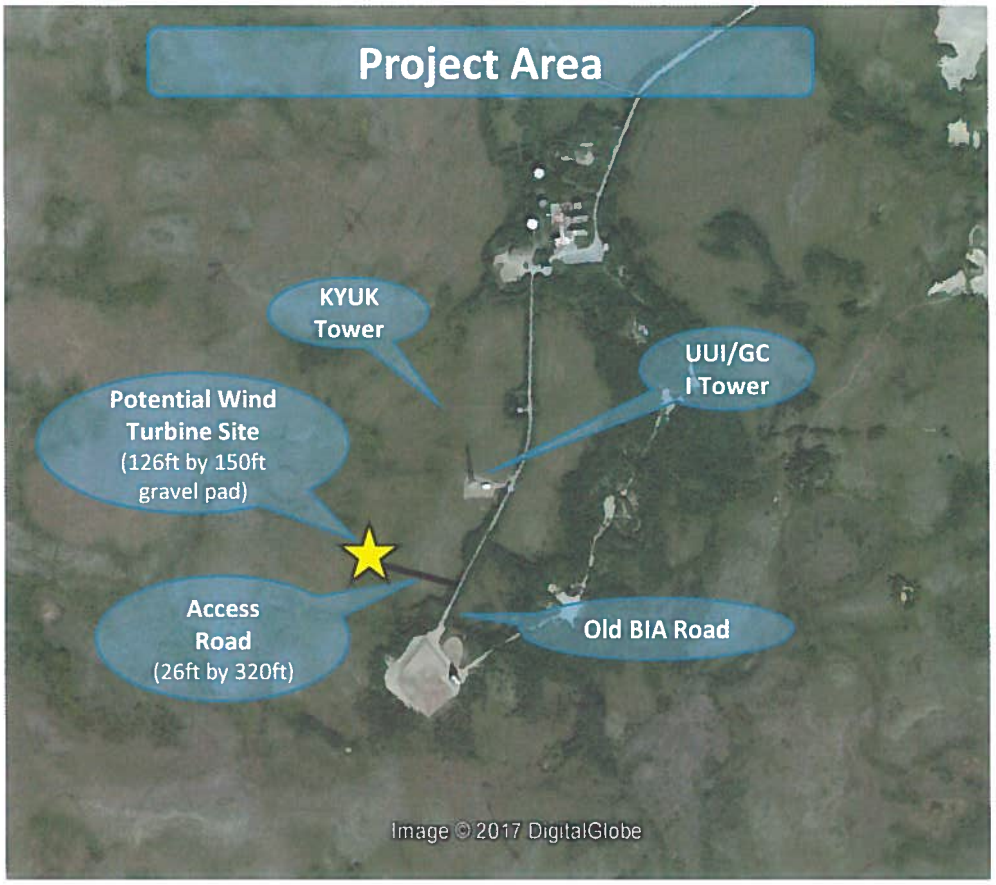
Email or call Anna Sattler, AVEC's Community Liaison, at asattler@avec.org or (907) 561-7972 for more information.

From: Petra Harpak [mailto:petra@kyuk.org]
Sent: Thursday, August 03, 2017 2:00 PM
To: Anna Sattler <asattler@avec.org>
Subject: Re: AVEC Bethel Radio PSA

Anna,
I've activated AVEC's PSA to start on August 14 and stop airing on August 23rd @ 7:30pm. Here is your PSA. To whom do I send the invoice to?



Wednesday, AUGUST 23 PUBLIC OPEN HOUSE

Bethel Wind Project

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Project Area

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Wind Turbine

The proposed wind turbine is an Emergya Wind Technologies DIRECTWIND 75-meter, 900 kW wind turbine with a traditional horizontal axis-design

Open House

Stop by anytime during open house hours to for more project details.

Yupiit Piciryarait Cultural Center
420 Chief Eddie Hoffman Highway
Bethel, AK 99559

Wednesday, August 23, 2017
5:30 pm-7:30 pm

AVEC ALASKA VILLAGE ELECTRIC COOPERATIVE

Bethel

QUESTIONS? For more information, attend the open house or contact:
Anna Sattler, AVEC Community Liaison
asattler@avec.org | 907.561.7972

From: Lenny Welch [mailto:lwelch@avec.org]
Sent: Thursday, August 3, 2017 3:49 PM
To: Olivia Cohn <olivia@solsticeak.com>
Cc: Onya Stein <ostein@avec.org>
Subject: RE: Bethel Wind Poster for August 23 Meeting

Hi Olivia
My assistant is in the process of posting them now, here are the locations
Alaska Commercial Store (main store)
Alaska Commercial Quick Stop
Swanson's Store
Swanson's Quick Stop
Sammy's Market
Corina's Store
Video World
Post Office
Alaska Village Electric Cooperative Member Service Office located in Alaska Commercial Store

This should cover most of the public high traffic areas around town.

Thanks Lenny

Wednesday, AUGUST 23 PUBLIC OPEN HOUSE

Bethel Wind Project

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AVEC

Bethel

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Stop by anytime during open house hours to for more project details.

Yupiit Piciryarait Cultural Center
420 Chief Eddie Hoffman Highway
Bethel, AK 99559

Wednesday, August 23, 2017
5:30 pm-7:30 pm

MINIATURE
SH SKIN BASKETS
BY
JENNIFER LENT

017 BETHEL ALASKA

Bethel Family Clinic-a Non-Profit Organization si

Bethel Family Clinic (BFC) will be constructing a new facility for medical services at 640 4th Ave. (formally Foss Property), across the street from the existing medical/behavioral health building. This project is over $3 Million and will provide 9 exam rooms and

Emerald Hagy

From: Emerald Hagy
Sent: Tuesday, August 1, 2017 11:57 AM
To: 'dean@kyuk.org'
Cc: Olivia Cohn
Subject: TV AD: Bethel Wind Project Public Meeting
Attachments: PubMtg_Poster2.pptx

Hello,

My name is Emerald. We spoke on the phone approximately a week ago regarding running a TV ad for the Bethel wind turbine public meeting. I have attached the ad to this email and if any formatting changes need to be made let me know. Also, would the ad be able to run as soon as possible all the way until the meeting, August 23, 2017?

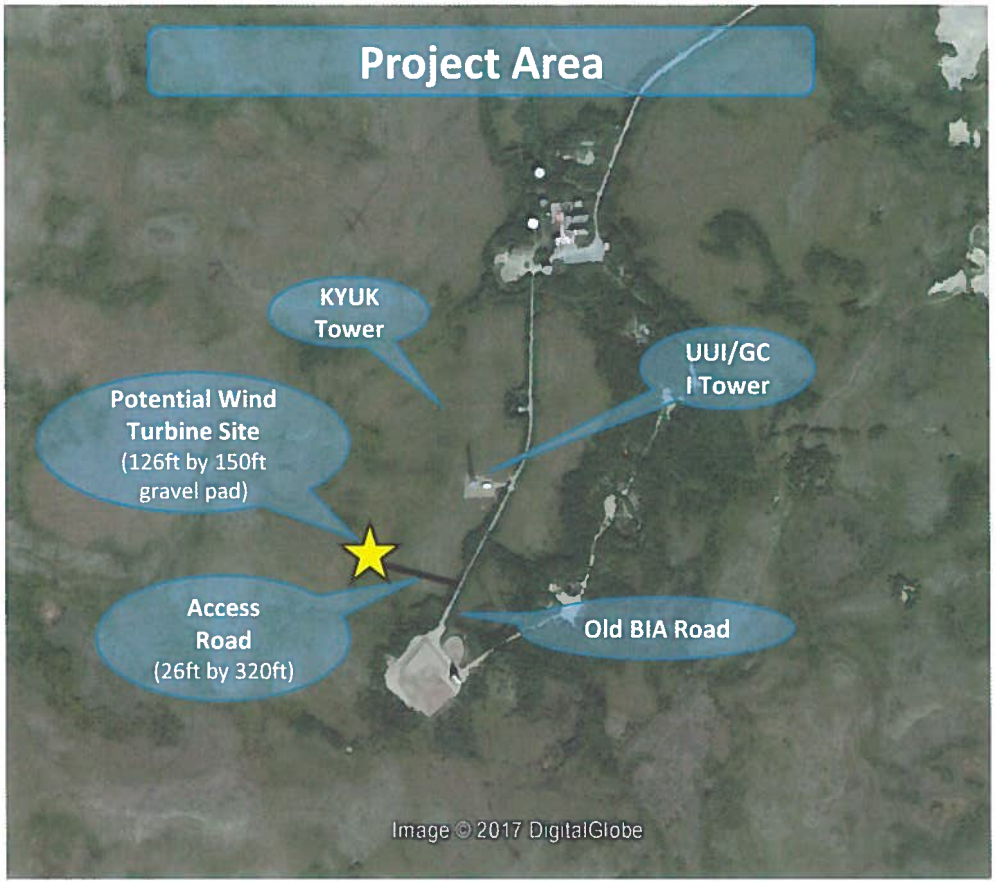
Thank you,

Emerald Hagy
emerald@solsticeak.com

From: Theresa [mailto:tquinn@gmail.com]
Sent: Tuesday, August 1, 2017 8:44 PM
To: Emerald Hagy <emerald@solsticeak.com>
Cc: Olivia Cohn <olivia@solsticeak.com>
Subject: Re: Bethel Wind Project Poster

of course! no problem!

Sent from my iPhone



Wednesday, AUGUST 23 PUBLIC OPEN HOUSE

Bethel Wind Project

AVEC, in partnership with Bethel Native Corporation, is planning to install a wind turbine in Bethel, Alaska. This new power source would add 2,370 MWh of energy annually to the existing energy systems serving Bethel, Oscarville, and Napakiak.

Project Area

The wind turbine would be installed and maintained on BNC lands off the Old BIA Road just south of the UUI/GCI tower.

Wind Turbine

The proposed wind turbine is an Emergya Wind Technologies DIRECTWIND 75-meter, 900 kW wind turbine with a traditional horizontal axis-design

Open House

Stop by anytime during open house hours to for more project details.

Yupiit Piciryarait Cultural Center
420 Chief Eddie Hoffmar Highway
Bethel, AK 99559

Wednesday, August 23, 2017
5:30 pm-7:30 pm

AVEC ALASKA VILLAGE ELECTRIC COOPERATIVE

Bethel

QUESTIONS? For more information, attend the open house or contact:
Anna Sattler, AVEC Community Liaison
asattler@avec.org | 907.561.7972

APPENDIX C.
PUBLIC OPEN HOUSE MEETING MATERIALS

1. Meeting Overview
2. Sign-In Sheet
3. Materials Presented

Bethel Wind Project

Public Open House • August 23, 2017 • 5:30 pm to 7:30 pm
Yupiit Piciryarait Cultural Center • 420 Chief Eddie Hoffman Highway

ALASKA VILLAGE ELECTRIC COOPERATIVE

Open House Stations Overview

Meeting Format

- This is an open house with hours from 5:30 pm to 7:30 pm
- SIGN IN, TALK WITH THE PROJECT TEAM, and VISIT STATIONS
- **No formal presentation will be made**

Meeting Purpose

- To provide an OVERVIEW OF THE BETHEL WIND PROJECT including design, potential visual impacts, and project location

Open House Stations

- **Station #1: Welcome and Sign In**
  - SIGN IN and then VISIT the information stations (see detail below)
- **Station #2: Alternative Locations and Wind Energy Project Constraints**
  - Review TURBINE DESIGN and LOCATIONS
  - Learn about CONSTRAINTS to wind development and turbine SITE CONSIDERATIONS
- **Station #3: Preferred Alternative Project Details**
  - View figures that depict preferred PROJECT LOCATION, proposed TURBINE DESIGN, and preferred SITE PLAN
  - Discuss the project SCHEDULE
- **Station #4: Potential Visual Impacts**
  - Review simulated photos of the preferred alternative to consider POTENTIAL VISUAL IMPACTS in Bethel
- **Station #5: Wind Turbine Informational Video**
  - Watch an AVEC video that depicts wind turbine project construction
- **Station #6: Comments**
  - Fill out a COMMENT SHEET or take one to submit later

Thank you for your time and participation! **For more information, contact:**

Anna Sattler, AVEC Community Liaison
asattler@avec.org • 907.561.7972

Robin Reich, Solstice Alaska Consulting, Inc.
robin@solsticeak.com • 907.929.5960

This meeting is being conducted to comply with the City of Bethel Ordinance #15-27 regarding establishment of tall towers.

Bethel Wind Project

Public Meeting • Open House • Wednesday, August 23, 2017

Thank you for your attendance today. Please sign in (legible print is appreciated)!

Name	Mailing Address	Email Address
Greg + Kelly Lincoln	PO Box 1028 Bethel	realnews@deltadiscovery.com
Chrysnel Evon		
Byron Hunter	PO Box 1531 Bethel 99558	—
Betsy Jumper	PO Box 2273	bjumper@cityofbethel.net
Nick Pollock	Box 2123	
Peter Moses	Akiachak Alaska	825-4116
Will Updegrove	PO Box 1872 Bethel	543-2426
Zha Marian		
Kyle Nicholi	P.O. Box 2211	545-8225
TED MEYER	PO Box 1388 Bethel, Ak. 99559	tmeyer@cityofbethel.net
Elias Venes	P.O. Box 384 Bethel 9955	—
Theresa Quiner	PO Box 1018 Bethel	tquiner@alaska.edu
Noel Daniels Or	PO Box Kienpel Ruethluk	

This meeting is being conducted to comply with the City of Bethel Ordinance #15-27 regarding establishment of tall towers.

Bethel Wind Project

Public Meeting • Open House • Wednesday, August 23, 2017

Thank you for your attendance today. Please sign in (legible print is appreciated)!

Name	Mailing Address	Email Address
Jackie Brink	Po. 13 99609 Kasigluk, AK	—
Stephen Sunnybag	PO 1568 188 East AW	
Huey Ashepak	Gen Del Bethel, AK 99559	—
Ira		
Paul Francis	P.O. Box 262 Bethel, AK.	
Ana MacArthur	PO Box 468 Bethel, AK 99559	
Lillie Reder	Box 1765 Bethel, AK 99559	—
Doreen Waska	Box 1974 Bethel AK 99559	dwaska77@gmail.com
[illegible]	Bethel AK PO Box 1851 99559	
J Sanders	P.O Box 527	Jeffco2004@yahoo.com
Nicholas Nauman	P.O. Box 1018	npnauman@gmail.com
ROXANNE GIRDLESTONE	P.O Box 2035	taniner@alaska.edu
James Whitman	General Bethel AK Delivery 99559	Jb_ak99559@outlook.com

This meeting is being conducted to comply with the City of Bethel Ordinance #15-27 regarding establishment of tall towers.

Bethel Wind Project

Public Meeting • Open House • Wednesday, August 23, 2017

Thank you for your attendance today. Please sign in (legible print is appreciated)!

Name	Mailing Address	Email Address
Lateesh. Elton		
Mary Anne	P.O. Box 32033 Mtn. Village AK 99632	
Lisa Demer	P.O. Box 2462 Bethel 99559	Ldemer@alaskadispatch
GRADY DEATON	P.O. BOX 368 BETHEL, AK 99559	S.GRADY.DEATON @GMAIL.COM
RAMON NUNEZ	PO BOX 2410 BETHEL ALASKA.	

This meeting is being conducted to comply with the City of Bethel Ordinance #15-27 regarding establishment of tall towers.

Bethel Wind Project

Public Meeting • Open House • Wednesday, August 23, 2017

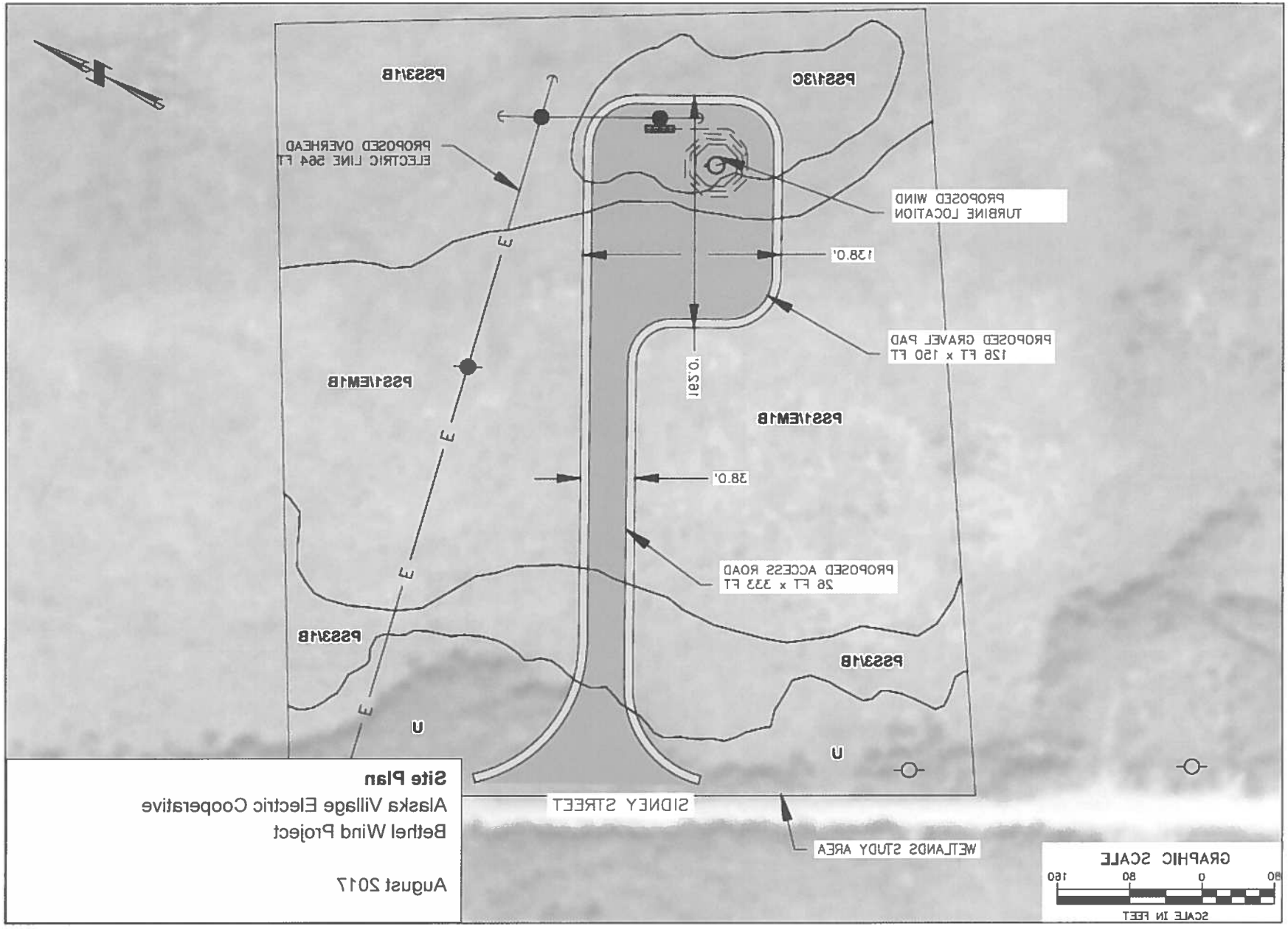
Thank you for your attendance today. Please sign in (legible print is appreciated)!

Name	Mailing Address	Email Address
Lüne		

This meeting is being conducted to comply with the City of Bethel Ordinance #15-27 regarding establishment of tall towers.

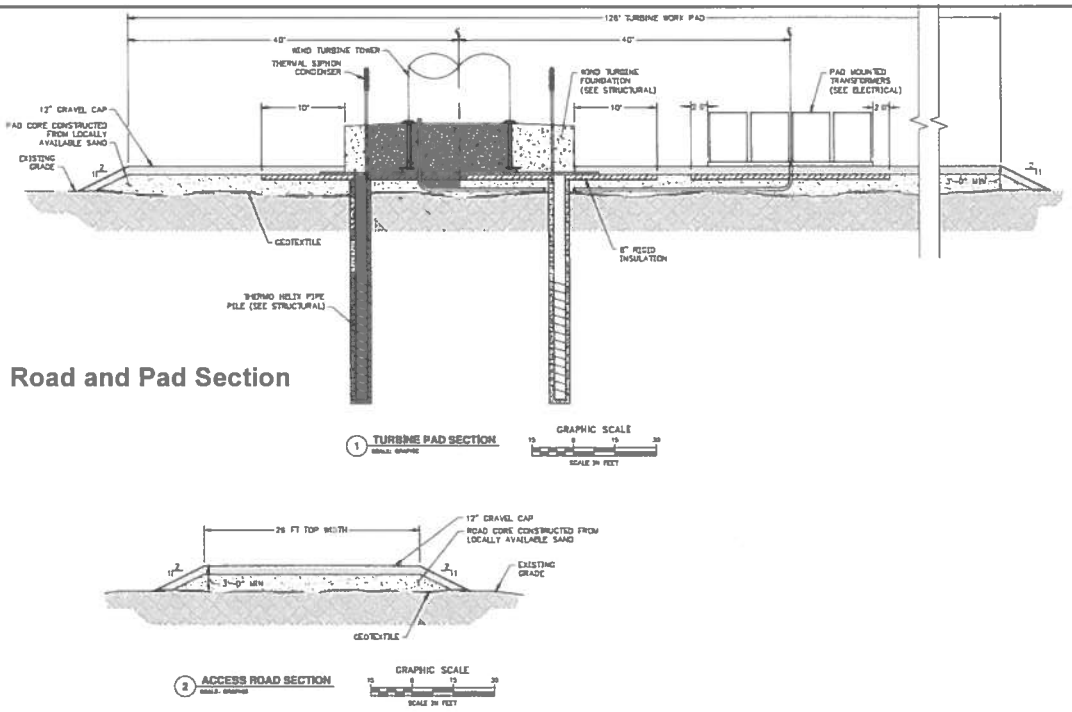
Project Vicinity with Project Location
Alaska Village Electric Cooperative
Bethel Wind Project

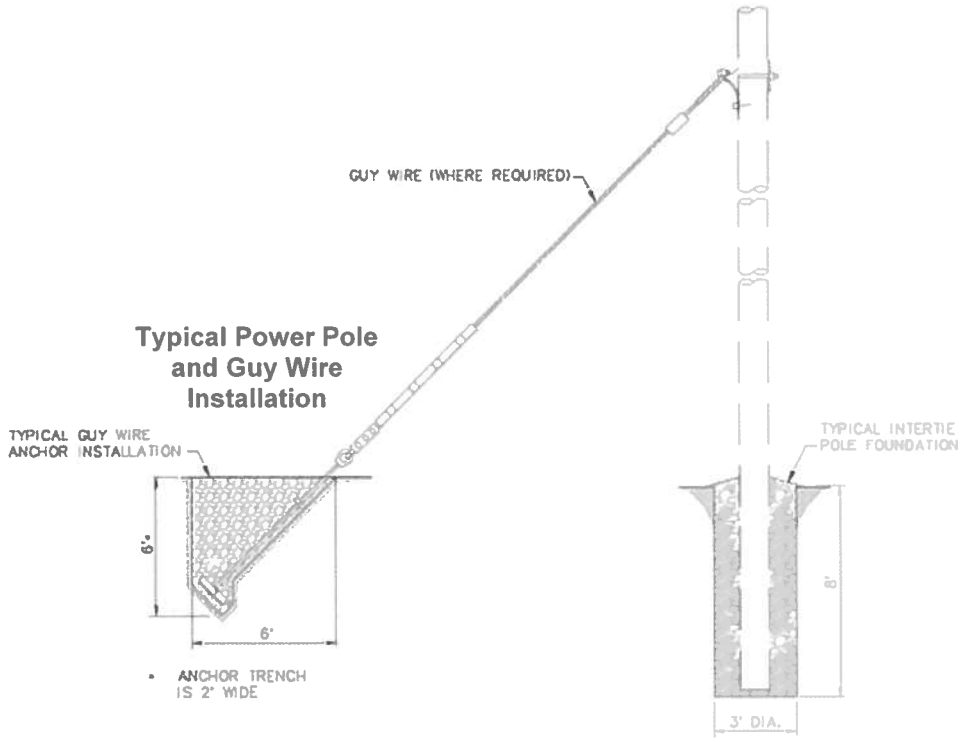
August 2017



Site Plan
Alaska Village Electric Cooperative
Bethel Wind Project

August 2017





Road and Pad Section, Typical Pole and Guy Wire

Alaska Village Electric Cooperative

Bethel Wind Project

August 2017

Alternatives
Alaska Village Electric Cooperative
Bethel Wind Project

August 2017

Photo 1. From BIA Road

LAT: 60°47'35.30"N LONG: 161°51'43.99"W

Photo 2. From Larson Subdivision

LAT: 60°47'50.49"N LONG: 161°51'10.40"W

Photo 3. From Tundra Ridge Subdivision

LAT: 60°48'18.96"N LONG: 161°48'59.67"W

Photo 4. From Chief Eddie Hoffman Highway

LAT: 60°47'24.70"N LONG: 161°50'1.39"W

Photo 5. From Veterans Memorial Cemetery

LAT: 60°46'54.64"N LONG: 161°51'53.43"W

Photo 6. From Airport Road

LAT: 60°46'35.35"N LONG: 161°50'49.60"W

Photo 7. From Tower Road

LAT: 60°46'37.81"N LONG: 161°51'23.25"W

Photo 8. From Kasayuli Subdivision

LAT: 60°46'20.79"N LONG: 161°52'26.60"W

APPENDIX D.
PUBLIC OPEN HOUSE MEETING VERBAL PUBLIC COMMENTS

From: Olivia Cohn [olivia@solsticeak.com]
Sent: Thursday, August 24, 2017 10:04 AM
To: Forest Button (fbutton@avec.org); Onya Stein; Anna Sattler; michael.kuca@hq.doe.gov; sstiker@avec.org; Lenny Welch; Jeff Stanley
Cc: Robin Reich
Subject: Bethel Wind Open House: Comments and Attendees

Hello all:

Thirty-three people attended the Bethel Wind Project open house yesterday (see the attached 33 sign ins).

Would you please reply to me with any comments (verbal or written) that you received so that we may summarize them in the meeting report to the City of Bethel?

Thank you,
Olivia

Olivia Cohn
Environmental Planner
Solstice Alaska Consulting, Inc.
2607 Fairbanks Street, Suite B, Anchorage, AK 99503
907-929-5960 | olivia@solsticeak.com<mailto:olivia@solsticeak.com>
www.solsticeak.com<http://www.solsticeak.com>

[SolsticeFinal]

From: Scott Stiker [mailto:sstiker@avec.org]
Sent: Thursday, August 24, 2017 10:31 AM
To: Olivia Cohn <olivia@solsticeak.com>
Subject: RE: Bethel Wind Open House: Comments and Attendees

Good morning Olivia,

All of my interactions with the community went very well. I fielded a lot of questions about the height, no one had an issue with it . How much power the turbine was going to be making, and only a few questions about the sound levels expected to be produced. When I gave them home objects to reference sound levels against, they all felt as if there would never be an issue with it. The only unpleasant comment was made by a gentleman whom stated "It will probably only be an issue, cause of the FAA, and the airport" . I could only smile and we would have to see.

Scott Stiker
Wind Fleet Supervisor
Alaska Village Electric Coop
4831 Eagle Street, Anchorage, AK 99503
Phone: 907-565-5319

From: Onya Stein [mailto:ostein@avec.org]
Sent: Thursday, August 24, 2017 10:38 AM
To: Olivia Cohn <olivia@solsticeak.com>
Cc: Forest Button <fbutton@avec.org>; Anna Sattler <asattler@avec.org>; michael.kuca@hq.doe.gov; Scott Stiker <sstiker@avec.org>; Lenny Welch <lwelch@avec.org>; Jeff Stanley <jstanley@crweng.com>; Robin Reich <robin@solsticeak.com>
Subject: RE: Bethel Wind Open House: Comments and Attendees

Thanks Olivia.
The questions/comments I received are below.

Do you plan on putting in 8 turbines? (thought the yellow pins were where turbines were going).
Is there a plan for more turbines?
How were the turbines put in the pictures?
Is the turbine already there?
Is there a heating system for the turbine for during the winter?
Can't hurt the view there is nothing out there.
Is the FAA the only outstanding barrier?
Additionally, someone commented they think the lagoon/landfill site is still viable and FWS need to leave us alone.

Onya Stein
Assistant Project Manager
Projects Development and Key Accounts
Alaska Village Electric Cooperative, Inc.
4831 Eagle Street, Anchorage, Alaska 99503
(907) 561-7927 - Direct
(907) 561-2388 - Fax
ostein@avec.org - Email
www.avec.org

From: Forest Button [mailto:fbutton@avec.org]
Sent: Thursday, August 24, 2017 10:54 AM
To: Olivia Cohn <olivia@solsticeak.com>; Onya Stein <ostein@avec.org>; Anna Sattler <asattler@avec.org>; michael.kuca@hq.doe.gov; Scott Stiker <sstiker@avec.org>; Lenny Welch <lwelch@avec.org>; Jeff Stanley <jstanley@crweng.com>
Cc: Robin Reich <robin@solsticeak.com>
Subject: RE: Bethel Wind Open House: Comments and Attendees

Oliva,

All of my interactions were positive. I was asked how the project would lower electric bills and I launched into an explanation about PCE.

Forest

From: Robin Reich
Sent: Thursday, August 24, 2017 11:03 AM
To: Olivia Cohn <olivia@solsticeak.com>; Forest Button (fbutton@avec.org) <fbutton@avec.org>; Onya Stein <ostein@avec.org>; Anna Sattler <asattler@avec.org>; michael.kuca@hq.doe.gov; sstiker@avec.org; Lenny Welch <lwelch@avec.org>; Jeff Stanley <jstanley@crweng.com>
Subject: RE: Bethel Wind Open House: Comments and Attendees

I heard:

- One commenter said that the birds are not a big deal for the site near the dump/lagoon. He said that birds can be trained not to go near the wind turbine.
- One commenter thought that it was interesting that the other BIA site, so close to the proposed site, was not accepted by the FAA.
- Many folks questioned the height of the turbine.

Robin Reich
Office: 907.929.5960
Cell: 907.903.0597

From: Anna Sattler [mailto:asattler@avec.org]
Sent: Thursday, August 24, 2017 10:59 AM
To: Forest Button <fbutton@avec.org>; Olivia Cohn <olivia@solsticeak.com>; Onya Stein <ostein@avec.org>; michael.kuca@hq.doe.gov; Scott Stiker <sstiker@avec.org>; Lenny Welch <lwelch@avec.org>; Jeff Stanley <jstanley@crweng.com>
Cc: Robin Reich <robin@solsticeak.com>
Subject: RE: Bethel Wind Open House: Comments and Attendees

I was asked the same question about what it would do to lower the cost of electric bills.

I texted Meera to see if she might be available to speak on behalf of AVEC for an interview with KYUK, she wasn't. It was nice to see ADN and Delta Discovery there as well. I had to tell all of them that I wasn't authorized to provide a statement from AVEC as per Meera's instructions that she is the only authorized interviewee for the Co-op.

-----Original Message-----
From: Jeff Stanley [mailto:jstanley@crweng.com]
Sent: Sunday, August 27, 2017 9:59 PM
To: Olivia Cohn <olivia@solsticeak.com>; Forest Button (fbutton@avec.org) <fbutton@avec.org>; Onya Stein <ostein@avec.org>; Anna Sattler <asattler@avec.org>; michael.kuca@hq.doe.gov; sstiker@avec.org; Lenny Welch <lwelch@avec.org>
Cc: Robin Reich <robin@solsticeak.com>
Subject: RE: Bethel Wind Open House: Comments and Attendees

Olivia,

The primary questions I was asked were as follows:

* What type of foundation will the wind turbine have? Answer- Driven pile foundation with thermosyphons to help keep the permafrost frozen.
* How tall will the wind turbine be? Answer - Approx 345 feet from the existing ground surface to the top of the blades.
* Which houses will get the wind power? Answer - The power from the wind turbine will be put in the distribution grid so all houses and businesses will benefit
* How much energy will the turbine produce? Answer - That depends on the wind but the unit is rated to produce up to 900 kw.
* Whats the average power demand? - I directed them to Lenny
* How much lower will electricity rates be? - They will remain about the same but the wind turbine will help stabilize rates since less fuel will be required. For more information I directed them to Forest
* Will the wind turbine be the same size as the one near the fitness center? - No, it will be taller and produce up to 9 times more energy
* The wind turbine at the fitness center seems to have had a bunch of problems with the controls. Will the proposed wind turbine be more reliable? Answer - The controls for wind turbines can be really complicated and proper maintenance is key. That's why AVEC has a team of workers dedicated to O&M of its wind turbines. For more information I directed them to Scott
* Will the wind turbine be noisy?
* What permits are required for the project? Answer - A USACE wetlands permit and City approval under the Tall tower ordinance. For more information I directed them to Robin.
* I live in Kasyli (Sp?) subdivision. Will I be able to see the wind turbine from my house? Answer - Yes, and I directed them to Onya.
* When will the turbine be installed? Answer - We're hoping to begin constructing the foundation this Fall and then erect the wind turbine next summer.
* Will the turbine have a light on the top of it? Answer - Yes
* Who is the contractor going to be for the project? Answer - STG will be the prime.

Other statements:

* The location is good because it's by the other antennas
* I like watching the blades go around, it feels like we are making progress.
* It's hardly noticeable in the photos
* I like the swooshing sound of the turbines when the wind is blowing

Thanks,

CITY OF BETHEL PLANNING OFFICE
Po Box 1388
Bethel, AK 99559
(907) 543-5306
(907) 543-5301
(907) 543-4168 (facsimile)

received
JAN 3 2018

Final Application

APPLICATION FOR A SPECIAL USE PERMIT
TALL TOWERS

Please enter the following information:

Owner of Tower Facility

Name of Owner: Alaska Village Electric Cooperative
Contact Name: Meera Kohler Telephone: 907-561-1818
Address: 4831 Eagle Street
City: Anchorage State: AK Zip: 99503
Email: mkohler@avec.org

Operator of Tower Facility: *Please check* ☐ *if same as above*

Name of Owner:
Contact Name: Telephone:
Address:
City: State: Zip:
Email:

Applicant (Developer): *Please check* ☐ *if same as above*

Name of Owner:
Contact Name: Telephone:
Address:
City: State: Zip:
Email:

Property Owner: *Please check* ☐ *if same as above*

Name of Owner: Bethel Native Corporation
Contact Name: Ana Hoffman Telephone: 907-543-2124
Address: 460 Ridgecrest Dr #211
City: Bethel State: AK Zip: 99559
Email: ahoffman@bncak.com

APPLICATION CHECKLIST

This document is provided as a resource for the Applicant to assist with preparing the Application submittal package. Please attach this checklist to the application. Please note that all applicable items are due at the time the application is submitted. **Incomplete applications will not be processed.**

REQUIRED DOCUMENT

Applicant must submit one (1) original, six (6) copies and one (1) electronic copy on either a CD or a Thumb Drive. ALL DOCUMENTS MUST BE CLEARLY LABELED AND IN THE ORDER BELOW.

- [x] Tower Description
  The Project Description and Letter of Intent (LOI) were submitted on 11/7/17 as part of the Request for Public Hearing Application.
- [x] Property Ownership & Authorization to Use Property
  The Owner Authorization Form, authorizing use of Bethel Native Corporation's land, was submitted on 11/7/17 as part of the Request for Public Hearing Application.
- [x] Tower Operations
  The Application Form, identifying the Tower Owner Operator, was submitted on 11/7/17 as part of the Request for Public Hearing Application.
- [x] Security Plan
  See attached Security Plan description. The Project Description, submitted on 11/7/17 as part of the Request for Public Hearing Application describes the wind turbine and its locked door at its base. The project will not include a fence.
- [x] Description of Signage
  See attached Signage description.
- [x] Lighting Description (if applicable)
  The Visual Impact Assessment that includes a written description of lighting was submitted on 11/7/17 as part of the Request for Public Hearing Application
- [x] Utilities; Setbacks; Parking
  The Site Plan, with locations and dimensions of the entire area and notes that setbacks are N/A, was submitted on 10/4/17, and Site Plan Permit No. 17-! was issued. The Project Description, that details the project site and access (including truck access to the turbine -- that can function as emergency parki and local utilities, was submitted on 11/7/17 as part of the Request for Public Hearing.
- [x] Notice to Applicants
  The Public Participation Report that includes the Nearest Property Owners Contacted (Appendix A) was submitted on 11/7/17 as part of the Request for Public Hearing Application.
- [x] Equipment Shelters (if applicable)
  N/A; however, the Project Description, submitted on 11/7/17 as part of the Request for Public Hearing Application, describes the project components (wind turbine, building pad, access road) for this project.
- [x] Landscaping Plan
  N/A; however, the LOI describes variances regarding how the turbine will not be screened from view, and the Visual Impact Assessment details visual impacts, lighting, tower base screening, and photo-simulations. Both documents were submitted on 11/7/17 as part of the Request for Public Hearing
- [x] Engineer Reports
  The Certification(s) of Engineers that confirms design standards and structural integrity was submitted on 11/7/17 as part of the Request for Public Hearing Application.
- [x] Determination of No Hazard to Air Navigation from the FAA
  The Letter of Intent including the FAA No Hazard to Air Navigation (Appendix C) was submitted on 11/7/17 as part of the Public Hearing Application.
- [x] Hazardous Materials Plan
  N/A; see attached Hazardous Materials Plan.
- [x] Decommissioning Plan
  N/A; see attached Decommissioning Plan.
- [x] Planning Commission Review Criteria - Questionnaire
  The City of Bethel Planning Commission Review Criteria form was submitted on 11/7/17 as part of the Request for Public Hearing Application.
- [x] Proof of Liability Insurance
  See attached Certificate of Insurance.
- [x] Visibility
  The Visual Impact Assessment, that includes a written description of visual impacts, lighting, and tower base screening, as well as photo simulations of the tower visibility, and Project Description, which includes anticipated visibility impacts, were submitted on 11/7/17 as part of the Request for Public Hearing Application.

Bethel Wind Project, Alaska Village Electric Cooperative
Application for a Special Use Permit, Tall Towers
Required Documents
December 2017

SECURITY PLAN

The Bethel Wind Project will be located and secured in a manner that prevents unauthorized access. Located at the end of a dead-end road to the southwest area of town, the entire Bethel Wind Project area is currently secured through an existing pole gate owned by the U.S. Fish and Wildlife Service that blocks access to Old BIA Road. With the exception of land owners and authorized personnel who have keys to this gate, it is secured from the general public. The wind turbine would have a locked door at its base for Alaska Village Electric Cooperative, Inc. (AVEC) maintenance personnel to enter. In addition, the wind turbine base design does not have a lattice, cannot be climbed, and is not an attractive nuisance.

During the Pre-Application Meeting, which took place in Bethel on July 28, 2017 including AVEC, the City of Bethel, and Solstice Alaska Consulting, Inc., it was stated that a new fence would not be constructed for this project. The Site Plan Application, for which Site Plan Permit No. 17-55 was issued on October 24, 2017, details the location and dimensions of the entire site area and equipment locations showing the proposed wind turbine site design without a new fence.

Given the existing security in the project area and the reasons stated above, no additional gates or security measures would be constructed for the wind turbine site, and it is believed to meet the requirements of the City of Bethel Ordinance #15-27, (section 16.10.110 General Standards and Design Requirements, B. Security of Tall Structures).

SIGNAGE

The turbine will contain an unlighted sign that is less than four square feet in size with a sufficiently-sized font that allows for readability in the immediate area of the turbine.

In keeping with City of Bethel Ordinance #15-27, (section 16.10.110 General Standards and Design Requirements, D. Signage), the sign will be affixed to a location that is visible from the access point of the site, and the sign will contain the following text.

Bethel Wind Project
Wind turbine owner and operator: Alaska Village Electric Cooperative
Emergency telephone number: 907-561-1818
City of Bethel Site Plan Permit No. 17-55; City of Bethel Special Use Permit No. (*TBD upon receipt of a permit*)

No other signage will be affixed to the tall structure.

HAZARDOUS MATERIALS PLAN

No hazardous materials would be handled, transported, or used with regard to this project.

During construction, non-hazardous solid waste will be generated, including building material waste and construction garbage. All materials would be handled according to the Occupational Safety and Health Administration (OSHA), and the construction contractor will be required to implement OSHA regulations that govern worker safety during the construction of wind turbine towers (29 CFR 1926) and associated infrastructure.

AVEC will responsibly dispose of any waste generated from construction and maintenance of the tower, and all waste would be disposed of within the Bethel Landfill, a Class 2 landfill.

DECOMMISSIONING PLAN

Decommissioning is not expected; instead, the wind turbine will be repowered by replacing outdated or worn components as needed. If decommissioning is required at the end of the equipment life-cycle, the turbine, including the tower and blades, would be disassembled and either disposed of at the Bethel Landfill or barged out of the community. It is expected that the gravel pad and access road would remain in place.

FEE

The $750.00 permit fee was paid on November 14, 2017 from AVEC to the City of Bethel (AVEC check #275379).

AVEC17-06

CERTIFICATE OF INSURANCE

12/29/2017

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

THIS IS TO CERTIFY THAT:

Alaska Village Electric Cooperative, Inc.
4831 Eagle Street
Anchorage, AK 99503

ARECA INSURANCE EXCHANGE

NAIC: 16926
703 West Tudor Road, Suite 101
Anchorage, AK 99503-6650
(907)771-5750

IS, AT THE ISSUE DATE OF THIS CERTIFICATE, INSURED BY THE COMPANY UNDER THE POLICY(IES) LISTED BELOW. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

TYPE OF INSURANCE	POLICY NUMBER	POLICY DATES	LIMITS ($)	
GENERAL LIABILITY COMMERCIAL GENERAL LIABILITY OCCURRENCE-BASIS COMPREHENSIVE FORM PREMISES / OPERATIONS UND / EXPLOSION & COLLAPSE PRODUCTS / COMP OPS CONTRACTUAL BROAD-FORM PROPERTY DAMAGE **NO GENERAL AGGREGATE**	ARB170010030A	4/1/2017 to 4/1/2018	EACH OCCURRENCE	$2,000,000
			DAMAGE TO RENTED PREMISES	$2,000,000
			MED EXP (PER PERSON)	$5,000
			PERSONAL & ADV INJURY	$2,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES / EQUIPMENT / EXCLUSIONS ADDED BY ENDORSEMENT / SPECIAL PROVISIONS

Evidence of insurance.

CERTIFICATE HOLDER:

City of Bethel
P.O. Box 1388
Bethel, AK 99559

CANCELLATION:

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE:

Pursuant to BMC 16.10, both the Tower Owner and the Applicant (if different), hereby submit this Application for a Special Use Permit.

TOWER OWNER:

Meera Kohler

Signature

Dated: 12/29/17

Printed Name: Meera Kohler

On this 29 day of December, 2017 before me, the undersigned, a Notary Public in and for the State of Alaska, personally appeared Meera Kohler, known to me to be the identical person who executed the foregoing instrument and who acknowledged to me that he/she executed the same freely and voluntarily, with full knowledge of its contents, for the uses and purposes therein mentioned.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and year above written.

[NOTARY SEAL]
State of Alaska
NOTARY PUBLIC
Onya Stein
My Commission Expires January 18, 2018

Onya Stein

Notary Public in and for the State of Alaska

My Commission Expires: January 18, 2018

APPLICANT:

Meera Kohler

Signature

Dated: 12/29/17

Printed Name: Meera Kohler

On this 29 day of December, 2017 before me, the undersigned, a Notary Public in and for the State of Alaska, personally appeared Meera Kohler, known to me to be the identical person who executed the foregoing instrument and who acknowledged to me that he/she executed the same freely and voluntarily, with full knowledge of its contents, for the uses and purposes therein mentioned.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and year above written.

[NOTARY SEAL]
State of Alaska
NOTARY PUBLIC
Onya Stein
My Commission Expires January 18, 2018

Onya Stein

Notary Public in and for the State of Alaska

My Commission Expires: January 18, 2018

OPERATOR:

Signature _____ Dated: 12/29/17

Printed Name: Meera Kohler

On this 29 day of December 2017 before me, the undersigned, a Notary Public in and for the State of Alaska, personally appeared Meera Kohler, known to me to be the identical person who executed the foregoing instrument and who acknowledged to me that he/she executed the same freely and voluntarily, with full knowledge of its contents, for the uses and purposes therein mentioned.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and year above written.

[NOTARY SEAL]

State of Alaska
NOTARY PUBLIC
Onya Stein
My Commission Expires January 18, 2018

_____
Notary Public in and for the State of Alaska
My Commission Expires: January 18, 2018

FOR OFFICIAL USE ONLY

City Departments and Agency Review

1. _____ Public Works
2. _____ Engineer
3. _____ City Planner
4. _____ Streets and Roads
5. _____ Fire Dept.
6. _____ Army Corp. of Eng.
7. _____ FEMA
8. _____ Other:

Carefully read instructions and applicable City code. Fill out forms completely. Attach information as needed. Incomplete applications will create a delay in the review process. Please provide one hard copy and one electronic copy via email.

Application Fee must be attached:	**$750.00**	Special Use Permit	
Payment Type:	☐ Credit Card	■ Check	☐ Money Order ☐ Cashier's Check

Chapter 16.10
TALL TOWERS

Sections:

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16.10.010 Purpose.

It is the purpose of this chapter to establish reasonable regulations for the placement, construction and modification of "tall structures" or "tall towers" (as defined in BMC 16.10.020), including wireless communication facilities ("WCFs") consistent with Section 704 of the Telecommunications Act of 1996, Pub. L. No. 104-104, 110 Stat. 56 (February 8, 1996) (codified at 47 U.S.C. § 332), Section

6409(a) of the Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. No. 112-96, 126 Stat. 156 (February 22, 2012) (codified at 47 U.S.C. § 1455(a)) and all other applicable law and regulations and to:

A. Promote the health, safety and general welfare of the public and the city;

B. Provide for adequate fall zones to protect from falling ice and debris, and potential tower failure;

C. Enable the orderly build-out of wireless communication infrastructure, wind energy conservation systems ("WECS") and other tall structures;

D. Encourage potential applicants for new tall structures to involve citizens early in the process so concerns can be mitigated prior to application for permits;

E. Minimize the overall impacts of tall structures by establishing standards for siting, design and screening and by requiring consistency;

F. Encourage the collocation of WCFs on existing structures thereby minimizing new visual impacts and reducing the need for new tall structures;

G. Encourage the placement of tall structures in a manner that minimizes the negative effects on the visual and scenic resources of all surrounding properties;

H. Accommodate the growing need and demand for wireless communications services; and

I. Promote alternative, affordable energy sources in the city. [Ord. 15-27 § 3.]

16.10.020 Definitions.

1. "Adverse impact" means a condition that creates, imposes, aggravates, or leads to inadequate, impractical, unsafe, or unhealthy conditions on a site proposed for development or on other properties and facilities.

2. "Ancillary structure" means any form of development associated with a telecommunication facility or tall structure, including but not limited to: foundations, concrete slabs on grade, guy anchors, generators, and transmission cable supports; however, specifically excluding equipment cabinets.

3. "Antenna" means a device used to transmit and/or receive electromagnetic waves in connection with any wireless communications service. Types of antenna include, but are not limited to, omni-directional antennas, directional antennas, multi- or single-bay, yagi or parabolic antennas.

4. "Antenna array" means a single or group of antennas or antenna elements and associated mounting hardware, transmission lines, or other appurtenances which share a common attachment device such as a mounting frame or mounting support structure for the purpose of transmitting or receiving electromagnetic waves.

5. "Appurtenant or associated facilities" means an accessory facility or structure serving or being used in conjunction with a tall structure and located on the same property or lot as the tall structure including, but not limited to, utility or transmission equipment storage shelters or cabinets.

6. "Base station" means the same as defined by the FCC in 47 C.F.R. § 1.40001(b)(1), as may be amended, which defines that term as:

> [a] structure or equipment at a fixed location that enables Commission-licensed or authorized wireless communications between user equipment and a communications network. The term does not encompass a tower... or any equipment associated with a tower.

Examples include, but are not limited to, any buildings, utility poles and light standards that support transmission equipment at the time an applicant files a permit application for a collocation or modification to that structure. As an illustration and not a limitation, the FCC's definition refers to any structure that actually supports wireless equipment even though it was not originally intended for that purpose. Examples include, but are not limited to, wireless facilities mounted on buildings, utility poles and transmission towers, light standards or traffic signals. A structure without wireless equipment replaced with a new one designed to bear the additional weight from wireless equipment constitutes a base station.

7. "Breakpoint technology" means the engineering design of a monopole wherein a specified point on the monopole is designed to be at least five (5) percent more susceptible to failure than any other point along the monopole so that in the event of structural failure, the failure will occur at the breakpoint rather than at the base plate, anchor bolts, or any other point on the monopole.

8. "Broadcast facilities" means a tower, antennas, or antenna arrays for FM/TV/HDTV broadcasting transmission facilities, and tower(s) utilized as antennas for an AM broadcast station that are licensed by the Federal Communications Commission.

9. "Collocation" means the same as defined by the FCC in 47 C.F.R. § 1.40001(b)(2), as may be amended, which defines that term as:

> [t]he mounting or installation of transmission equipment on an eligible support structure for the purpose of transmitting and/or receiving radio frequency signals for communications purposes.

As an illustration and not a limitation, the FCC's definition effectively means "to add" and does not necessarily refer to more than one wireless facility installed at a single site.

10. "Commercial" means having profit as a chief aim.

11. "Commercially impracticable" means the inability to perform an act on terms that are reasonable in commerce. The inability to achieve a satisfactory financial return on investment or profit, standing alone, shall not be considered "commercial impracticability" and shall not render an act or the terms of an agreement commercially impracticable.

12. "Conditional use" means a use of a structure or land, which may be allowed by the planning commission after a public hearing and review and subject to certain prescribed or imposed conditions.

13. "Conditional use permit (CUP)" means a written document which may specify controls, restrictions and safeguards on the conditional permitted activity to ensure compatibility with permitted uses.

14. "EIA/TIA 222" means the most current structural standards for steel antenna towers and antenna support structures published by the Telecommunication Industry Association and accredited by the American National Standards Institute.

15. "Eligible facilities request" means the same as defined by the FCC in 47 C.F.R. § 1.40001(b)(3), as may be amended, which defines that term as:

> [a]ny request for modification of an existing tower or base station that does not substantially change the physical dimensions of such tower or base station, involving: (i) [c]ollocation of new transmission equipment; (ii) [r]emoval of transmission equipment; or (iii) [r]eplacement of transmission equipment.

16. "Eligible support structure" means the same as defined by the FCC in 47 C.F.R. § 1.40001(b)(4), as may be amended, which defines that term as:

> [a]ny tower or base station as defined in this section, provided that it is existing at the time the relevant application is filed with the State or local government under this section.

17. "Equipment cabinet" means an encasement used to house and protect the electronic equipment, including but not limited to air conditioning units and emergency generators. Equipment cabinets may be ground mounted, wall mounted, frame mounted or tower mounted.

18. "Equipment shelter" means a structure or vault designed solely or primarily to house and protect equipment.

19. "Equipment compound" means the area occupied by a tower including areas inside or under the following: an antenna-support structure's framework, equipment cabinets, ancillary structures such as equipment necessary to operate the antenna on the tower, including cabinets, shelters, pedestals, and other similar structures, and access ways.

20. "Existing tower" or "existing base station" have the same meanings as those terms are defined in 47 C.F.R. § 1.40001(b)(5), as may be amended, which states that:

> constructed tower or base station is existing for purposes of this section if it has been reviewed and approved under the applicable zoning or siting process, or under another State or local regulatory review process, provided that a tower that has not been reviewed and approved because it was not in a zoned area when it was built, but was lawfully constructed, is existing for purposes of this definition.

21. "FAA" means the Federal Aviation Administration or its duly designated and authorized successor agency.

22. "Fall radius" means the circular area measured from the base of the tower outward in a circular pattern (radius) for a distance of one hundred (100) percent of the proposed or existing tower's height including appurtenances.

23. "FCC" means the Federal Communications Commission or its duly designated and authorized successor agency.

24. "Feasible" means consistent with sound engineering practice and not causing environmental, social, or economic costs that outweigh the public benefit to be derived from compliance with the standard which is modified by the term "feasible and prudent."

25. "Feed lines" means cables used as the interconnecting media between the transmission/receiving base station and the antenna.

26. "Fence" means a fence other than one made of chain link, chicken wire, or similar materials.

27. "Flush mounted" means any antenna or antenna array attached directly to the face of the support structure or building in a manner that permits mechanical beam tilting if necessary but such that no portion of the antenna extends above the height of the support structure or building.

28. "Geographic search area" means an area designated by a wireless provider or operator for a new base station or WCF, produced in accordance with generally accepted principles of wireless engineering.

29. "Guy wire" means any wire or cable that provides structural support between a tower and the ground.

30. "Height (tall structure)" means the vertical distance measured from finished grade to the highest point of the tall structure, not including appurtenances or equipment affixed thereto.

31. "Landscape" means:

a. An expanse of natural scenery; or

b. To add lawns, trees, plants and other natural and decorative features to land.

32. "Monopole" means a style of freestanding WCF consisting of a single shaft usually composed of two or more hollow sections that are in turn attached to a foundation. This type of WCF is designed to support itself without the use of guy wires or other stabilization devices. These facilities are mounted to a foundation that rests on or in the ground or on a building's roof.

33. "Nonconcealed" means a tall structure that has not been treated, camouflaged, or disguised to blend with its surroundings and is readily identifiable.

34. "Propagation study" means a computer generated study estimating the signal emanating, and prediction of coverage, from antennas or repeaters sited on a specific tower or structure.

35. "Radio frequency emissions" or "RF" means any electromagnetic or other communication signal emitted from an antenna that is regulated by the FCC.

36. "Screening" means a method of visually shielding or obscuring one abutting or nearby structure or use from another by fencing, walls, berms or densely planted vegetation.

37. "Setback" means the required distance between the tall structure and the property line or right-of-way line to allow for a fall radius.

38. "Site" means the same as defined by the FCC in 47 C.F.R. § 1.40001(b)(6), as may be amended, which provides that:

> [f]or towers other than towers in the public rights-of-way, the current boundaries of the leased or owned property surrounding the tower and any access or utility easements currently related to the site, and, for other eligible support structures, further restricted to that area in proximity to the structure and to other transmission equipment already deployed on the ground.

39. "Structure" means anything which is constructed or erected and located on or under the ground, or attached to something fixed to the ground, including the following:

a. A building, regardless of size, purpose, or permanence;

b. A tower, sign, antenna, pole or similar structure;

c. A basement, foundation, or mobile home pad;

d. A fence;

e. A sign;

f. A street, road, sidewalk, driveway, parking area, or storage area.

40. "Section 6409(a)" means Section 6409(a) of the Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. No. 112-96, 126 Stat. 156 (February 22, 2012) (codified at 47 U.S.C. § 1455(a)), and the Federal Communications Commission's regulations codified at 47 U.S.C. § 1.40001 et seq.

41. "Substantial change" means the same as defined by the FCC in 47 C.F.R. § 1.40001(b)(7), as may be amended, which defines that term differently based on the particular facility type and location. For convenience purposes, the restated definition in this chapter organizes the FCC's criteria and thresholds for a substantial change according to the facility type and location.

a. For towers outside the public rights-of-way, a substantial change occurs when any of the following are true:

i. The proposed collocation or modification increases the overall height more than ten (10) percent or the height of one (1) additional antenna array not to exceed twenty (20) feet (whichever is greater); or

ii. The proposed collocation or modification increases the width more than twenty (20) feet from the edge of the wireless tower or the width of the wireless tower at the level of the appurtenance (whichever is greater); or

iii. The proposed collocation or modification involves the installation of more than the standard number of equipment cabinets for the technology involved, not to exceed four (4); or

iv. The proposed collocation or modification involves excavation outside the current boundaries of the leased or owned property surrounding the wireless tower, including any access or utility easements currently related to the site; or

v. The proposed collocation or modification would defeat the existing concealment elements of the support structure as determined by the planning director; or

vi. The proposed collocation or modification violates a prior governmental condition of approval; provided, however, that the collocation need not comply with any prior governmental condition of approval related to height, width, equipment cabinets or excavation that is inconsistent with the thresholds for a substantial change described in this section.

b. For towers in the public rights-of-way and for all base stations wherever located, a substantial change occurs when any of the following are true:

i. The proposed collocation or modification increases the overall height more than ten (10) percent or ten (10) feet (whichever is greater); or

ii. The proposed collocation or modification increases the width more than six (6) feet from the edge of the wireless tower or base station; or

iii. The proposed collocation or modification involves the installation of any new equipment cabinets on the ground when there are no existing ground-mounted equipment cabinets; or

iv. The proposed collocation or modification involves the installation of any new ground-mounted equipment cabinets that are ten (10) percent larger in height or volume than any existing ground-mounted equipment cabinets; or

v. The proposed collocation or modification involves excavation outside the area in proximity to the structure and other transmission equipment already deployed on the ground; or

vi. The proposed collocation or modification would defeat the existing concealment elements of the support structure as determined by the planning director; or

vii. The proposed collocation or modification violates a prior governmental condition of approval; provided, however, that the collocation need not comply with any prior governmental condition of approval related to height, width, equipment cabinets or excavation that is inconsistent with the thresholds for a substantial change described in this section.

Note: The thresholds for height increases are cumulative limits. For sites with horizontally separated deployments, the cumulative limit is measured from the originally permitted support structure without regard to any increases in size due to wireless equipment not included in the original design. For sites with vertically separated deployments, the cumulative limit is measured from the permitted site dimensions as they existed on February 25, 2012, the date that Congress passed Section 6409(a).

42. "Tall structure" or "tall tower" means a structure that is over one hundred (100) feet above grade. The term includes, but is not limited to, tethered balloons, flagpoles, sculptures, buildings, water

tanks, derricks, cranes, signs, chimneys, area illumination poles, towers, broadcast facilities, and supports for communication.

43. "Telecommunication" means the technology which enables information to be exchanged through the transmission of voice, video, or data signals by means of electrical or electromagnetic systems.

44. "Tower," as applied to wireless facilities, means the same as defined by the FCC in 47 C.F.R. § 1.40001(b)(9), as may be amended, which defines that term as:

> [a]ny structure built for the sole or primary purpose of supporting any [FCC]-licensed or authorized antennas and their associated facilities, including structures that are constructed for wireless communications services including, but not limited to, private, broadcast, and public safety services, as well as unlicensed wireless services and fixed wireless services such as microwave backhaul, and the associated site.

Examples include, but are not limited to, monopoles, mono-trees and lattice towers.

45. "Tower base" means the foundation, usually concrete or steel, on which the tower and other support equipment is situated. For measurement calculations, the tower base is that point on the foundation reached by dropping a perpendicular from the geometric center of the tower.

46. "Tower height" means the vertical distance measured from the natural lay of the land or ground to the uppermost point of a freestanding or guyed telecommunication tower or other type of tall tower and includes any antenna, beacon, light or other structure(s) attached to the tall tower.

47. "Transmission equipment" means the same as defined by the FCC in 47 C.F.R. § 1.40001(b)(8), as may be amended, which defines that term as:

> [e]quipment that facilitates transmission for any [FCC]-licensed or authorized wireless communication service, including, but not limited to, radio transceivers, antennas, coaxial or fiber-optic cable, and regular and backup power supply. The term includes equipment associated with wireless communications services including, but not limited to, private, broadcast, and public safety services, as well as unlicensed wireless services and fixed wireless services such as microwave backhaul.

48. "Wind energy conversion system (WECS)" means any device such as a wind charger, windmill, turbine, energy ball, wind tower, or another similar device, which is typically mounted to a tower or pole, and its associated mechanical and electrical equipment, which is designed to convert wind energy to a form of usable energy.

49. "Wireless" means any FCC-licensed or authorized wireless communication service transmitted over frequencies in the electromagnetic spectrum. This term is broader than personal wireless services as defined in 47 U.S.C. § 332(c)(7)(C)(i), and includes but is not limited to Wi-Fi, broadcast, satellite and other similar over-the-air services.

50. "Wireless communication facility (WCF)" means any manned or unmanned location for the transmission and/or reception of radio frequency signals or other wireless communications, and usually consisting of an antenna or group of antennas, transmission cables, and equipment cabinets, and may include an antenna support structure. The following developments shall be considered a

WCF: developments containing new, mitigated, or existing antenna support structures, public antenna support structures, replacement antenna support structures, collocation on existing antenna support structures, attached wireless communications facilities, concealed wireless communication facilities, and nonconcealed wireless communication facilities. [Ord. 15-27 § 3.]

16.10.030 Application.

A. This chapter shall apply to:

1. All private and public lands within the city of Bethel;

2. All tall structures taller than one hundred (100) feet including, but not limited to:

   a. Broadcast facilities,

   b. Towers, and

   c. Wind energy conversion systems.

3. Development activities including installation, construction, or modification of all tall structures including, but not limited to:

   a. Existing structures,

   b. Proposed structures, and

   c. Collocated facilities on existing structures.

B. The number of tall structures authorized by the planning commission shall be the minimum reasonably required to provide services.

C. Permits are required prior to construction, modification, replacement or removal of all tall structures.

D. To the greatest extent feasible, location of tall structures shall be in compatible areas where the adverse impact of the use is minimized.

E. Permits under this chapter will not be approved unless the applicant has provided evidence demonstrating that the proposal conforms to the applicable provisions of this chapter as well as all applicable zoning requirements.

F. Notwithstanding subsection A of this section, a written permit application for a modification or collocation to an existing tower or an existing base station submitted for approval under Section 6409 (a) shall be governed exclusively under BMC 16.10.330. [Ord. 15-27 § 3.]

16.10.040 Exceptions.

A. A government-owned or temporary tall tower installed upon the declaration of a state of emergency by federal, state or local government, or a written determination of public necessity by the city manager; except that such facility must comply with all federal and state requirements. The tall tower shall be exempt from the provisions of this chapter for up to four (4) months after the duration of the

state of emergency. An additional extension, no longer than three (3) months, may be granted by the city council upon written request and determination that the tall tower facilities continue to be necessary for post-emergency operations; and

B. Temporary tall structures, including but not limited to drilling derricks and construction cranes which are utilized on active construction projects or are on site less than one hundred eighty (180) calendar days total within a consecutive six- (6-) month period and are not intended to routinely reoccur on the same site;

C. The following items are also exempt from the provisions of this chapter:

1. Church spires, religious icons, and flag poles displaying official government or religious flags;

2. Lighting support structures less than one hundred (100) feet in height that are constructed for the Alaska Department of Transportation, are located within a right-of-way, and are used exclusively for illuminating main arterials and highways;

3. Routine maintenance and repair of tall structures and their components. [Ord. 15-27 § 3.]

16.10.050 Location preferences.

A. Tall structure locations must be approved in accordance with the following location preferences, one being the highest priority and six being the lowest priority:

1. Collocated antenna on existing tall structure;

2. Concealed attached structures;

3. Nonconcealed attached structures;

4. New concealed freestanding structures;

5. New nonconcealed freestanding structures;

6. Any lighted tall structure or any tall structure requiring air navigation lighting.

B. If the proposed location is not the highest priority listed above, then a detailed explanation justifying why a site of a higher priority was not selected must be submitted with the tall tower application. Any application seeking approval to locate a tall tower in a lower-ranked location may be denied unless the applicant demonstrates to the satisfaction of the planning commission the following:

1. That despite diligent efforts to adhere to the established hierarchy, doing so is technically infeasible or commercially impractical; and

2. The reason or reasons why the application should be approved for the proposed location. [Ord. 15-27 § 3.]

16.10.060 Collocation.

A. In all applications for construction of a new tall tower, the applicant must prove by substantial evidence that a bona fide need exists for the facility and that no reasonable combination of locations, techniques or technologies will obviate the need. The applicant must further prove that it has made all reasonable efforts to procure space on existing facilities and that the cost of collocation exceeds the cost of a new facility by at least fifty (50) percent.

B. Prior to the issuance of a permit for a new tall tower, the applicant shall demonstrate commitment to joint use as follows:

1. The applicant requesting the permit shall submit evidence to the city demonstrating that a genuine effort has been made to solicit additional users for the proposed new tower. Evidence of this shall include, at a minimum, copies of notices sent by certified mail, return receipt requested, to other potential users in the city, advising of the intent to construct a new tower, identifying the location, inviting the joint use and sharing of costs, and requesting a written response within thirty (30) calendar days. The applicant's letter(s) as well as response(s) must be presented to the planning commission as a means of demonstrating the need for a new tower.

2. The applicant shall sign an instrument, maintained by the city, agreeing to encourage and promote the joint use of the tall tower within the city and, to that extent, committing that there shall be no unreasonable act or omission that would have the effect of excluding, obstructing or delaying joint use of any tower where fair and just market reasonable compensation is offered for such use. [Ord. 15-27 § 3.]

16.10.070 Permit required.

No person shall be permitted to place, build, construct, modify, prepare, replace or remove any tall structure or appurtenant equipment without having first obtained the appropriate permit from the city. All applicants for a permit and any modification of such must comply with the requirements set forth in this chapter. [Ord. 15-27 § 3.]

16.10.080 Types of permits.

A. Special use permit: required for all new tall structures regardless of height or zoning location. Receipt of a special use permit does not alleviate any zoning requirement for a conditional use permit.

B. Network improvement permit: required before any legally constructed tall structure's height may be increased pursuant to BMC 16.10.190.

C. Modification permit: required before any legally constructed tall structure may be modified, unless the applicant applies for a Section 6409(a) modification permit.

D. Reconstruction and replacement permit: Required before any legally constructed tall structure can be reconstructed or replaced.

E. Removal permit: required prior to the demolition, relocation or removal of any tall structure.

F. Section 6409(a) modification permit: required before any tall structure may be modified when the applicant asserts in writing that Section 6409(a) applies to its proposed project. [Ord. 15-27 § 3.]

16.10.090 Preapplication requirements.

A. Prior to submission of an application, the applicant shall meet with the planning director for the purpose of discussing the site and development proposal, and to address any issues that will help to expedite the review and permitting process, including the scope of the visual assessment the applicant will be required to provide as part of the permit process. The preapplication process may also include a site visit, as determined by the planning director. No statement by either the applicant or the planning director shall be regarded as binding or authoritative for purposes of this section.

B. Visual Impact Assessment. The scope of the required assessment will be reviewed at the pre-application meeting, but the planning commission may require submission of a more detailed visual analysis after submittal of the actual permit application. The visual impact assessment must include:

1. A "zone of visibility map" sufficient in detail to allow for a determination of where the tall structure may be seen;

2. Current maps at appropriate scale, showing the location of the proposed use and the locations of other tall structure facilities operated by the applicant and those within two (2) miles of the proposed tall structure;

3. An analysis demonstrating that the tall structure will be sited so as to have the least adverse visual impact on the environment and its character, on existing vegetation, and on the properties in the area, while still meeting the applicant's objectives;

4. A "before" pictorial representation of the proposed tall structure site together with photo-simulated postconstruction renderings of the completed proposed support structures, equipment cabinets, and ancillary structures which must, at a minimum, include renderings from multiple vantage points of any adjacent roadways and occupied or proposed nonresidential or residential structures, and other locations as determined by the planning director. The "before" representations and photosimulations shall be from the same locations. The applicant shall also provide simulated photographic evidence of the proposed tall structure's appearance from any and all residential zones (as identified in the city of Bethel's latest comprehensive plan) that are within one thousand five hundred (1,500) feet of the proposed site, from vantage points approved by the planning director. The photosimulated renderings must represent, at a minimum, the proposed tall structure's overall height, configuration, physical location, mass and scale, materials and color, illumination and architectural design. The applicant shall also submit proposed exterior paint and stain samples for any items to be painted or stained, and exterior building material and roof samples;

5. Elevation drawings of the facilities depicting existing and proposed tall structures, other structures, landscaping, proposed color(s), method of camouflage and illumination;

6. A description of the visual impact of the tower base and accessory buildings from abutting properties and streets;

7. The applicant shall demonstrate, in writing and by drawing, how it will effectively screen from view the base of its proposed tall structure tower and all appurtenant facilities and structures;

8. If the tower is to be lit, a description of the specific type of lighting applicant proposes using and a description of how the applicant will comply with a directive in BMC 16.10.110(E), requiring the lighting be oriented, shielded or otherwise designed so as to not project directly onto surrounding property; and

9. When the proposed tall structure facility is to include a new tower, a plot plan at a scale of not less than one (1) inch is equal to one hundred (100) feet must be submitted. This plot plan must indicate all building uses within three hundred (300) feet of the proposed new facility. Aerial photos and/or renderings may augment the plot plan.

C. The applicant shall provide evidence that the proposed facility is designed to meet the minimum height requirement necessary for effective functioning of the tower's intended use.

D. A site plan, drawn to scale under the seal of a qualified Alaska registered surveyor, clearly indicating all site boundaries, location of existing and proposed tall structures, antennas, other structures and other development on site, means of access, screening and fencing, topography, landscaping, drainage management, adjacent public easements and rights-of-way.

E. The applicant shall provide evidence that the proposed tall structure will not interfere with the approaches to any existing airport or airfield, including water bodies supporting aircraft use.

F. The applicant shall provide the results of a propagation study for the proposed tall structure which must have been conducted within the previous twelve (12) months.

G. Community Meeting. Prior to applying for a special use permit for a new tall structure, the potential applicant shall hold at least one (1) community meeting.

1. The meeting must be held at a centrally located public location capable of seating a minimum of forty (40) people;

2. Notice of the meeting must be published in a newspaper of local circulation a minimum of two (2) times prior to the meeting;

3. Notice of the meeting must be announced on the local radio a minimum of five (5) times during the week prior to the meeting;

4. Notice of the meeting must be posted on at least three (3) bulletin boards within the city limits which are generally accessible to the public;

5. Notice of the meeting must also be mailed by the applicant to all property owners within one thousand two hundred (1,200) feet of the parcel(s) under consideration for the proposed tall structure;

6. The meeting must be held at least fifteen (15) calendar days after all notifications are completed;

7. The meeting may not start prior to 5:30 p.m. or later than 7:00 p.m.;

8. Notification of the meeting must, at a minimum, include the following:

a. A legal description and map of the general parcel, or parcels, within the coverage area under consideration for the tall structure and upon which the tall structure is intended to be placed;

b. A description of the proposed development including height, design, lighting, potential access to the site and proposed service;

c. The date, time, and location of the informational meeting; and

d. The contact name, telephone number, and address of applicant;

9. A written report summarizing the results of the community meeting must be prepared and submitted to the planning director prior to submitting an application for a new tall structure permit. At a minimum, the written report must include the following information:

a. The date(s) and location(s) of all meetings where citizens were invited to discuss the potential applicant's proposal;

b. The content, dates mailed, and number(s) of mailings, including letters, meeting notices, newsletters and other publications;

c. Sign-in sheet(s) used at the meeting, that includes places for names, addresses, phone numbers and other contact information such as e-mail addresses for the meeting participants;

d. A list of residents, property owners, and interested parties who have requested, in writing, that they be kept informed of the proposed development through notices, newsletters, or other written materials;

e. The number of people who attended meeting(s);

f. Copies of written comments received at the meeting;

g. A certificate of mailing identifying all who were notified of the meeting; and

h. A written summary that addresses the following:

i. The substance of the public's written concerns, issues, and problems;

ii. How the applicant has addressed, or intends to address, concerns, issues and problems expressed during the process; and concerns, issues, and problems the applicant has not addressed or does not intend to address and why. [Ord. 15-27 § 3.]

16.10.100 Permit application process.

A. Applicants shall submit to the planning department:

1. Applications on a form specified by the planning department; and

2. Site plans for all tall structures.

B. At the time that a person submits an application for a permit for any type of tall structure, such person shall pay a nonrefundable application fee to the city, as set forth in the city's fee and rate schedule.

C. In addition to the application fee, the planning director may require a technical review by a third party expert, the actual costs of which shall be borne by the applicant.

D. Based on the results of the technical review, the planning director may require changes or additional documentation before the application will be considered complete. The technical expert review may address some or all of the following, at the discretion of the director:

1. The accuracy and completeness of the items submitted with the application;

2. The applicability of analysis, techniques and methodologies proposed by the applicant;

3. The validity of conclusions reached by the applicant;

4. Whether the proposed tall structure complies with applicable approval criteria set forth in this chapter, the Bethel Municipal Code and the Bethel comprehensive plan as applicable; and

5. Other matters deemed to be relevant to determining whether a proposed tall structure complies with the provisions of this chapter. [Ord. 15-27 § 3.]

16.10.110 General standards and design requirements.

A. Concealed and Nonconcealed Antennas.

1. Antennas must be mounted on tall structures so as to present the smallest possible silhouette, profile, or cross-section, unless applicant provides sufficient evidence that doing so would prohibit the applicant from properly deploying the network. New antenna mounts must be flush-mounted onto existing tall structures, unless it is demonstrated through RF propagation analysis that flush-mounted antennas will not meet the network objectives of the desired coverage area.

2. Attached, concealed feed lines and antennas must be designed to architecturally match the facade, roof, wall, or structure on which they are affixed so that they blend with the existing design, color, and texture of the structure.

B. Security of Tall Structures. All tall structures must be located, fenced and secured in a manner that prevents unauthorized access.

1. All antennas, towers and other supporting structures must be constructed or shielded to reasonably prevent unauthorized access.

2. Transmitters and telecommunications control points must be installed in a manner to be readily accessible only to persons authorized to operate or service them.

3. A fence or wall not less than eight (8) feet in height with a secured gate must be maintained around the base of the tower, the equipment shelter and any guy wires, either completely or individually as determined by the planning director. The security fence must be locked when the facility is unattended.

C. Height Restrictions.

1. Support structures must be designed to be the minimum height needed to meet the service objectives of the applicant and anticipated collocators.

2. No new tall structures shall exceed two hundred fifty (250) feet in height. However, in the event of dense vegetation or other substantial obstacles to the intended purpose of the tall structure, facility height can be extended to no more than three hundred fifty (350) feet by special permission of the planning commission.

3. Tall structures that simulate objects that typically occur in landscapes similar to the proposed location (except electrical transmissions or telecommunication towers) may exceed two hundred fifty (250) feet in height if, based on the judgment of the planning commission, it would appear in context to the landscape, is aesthetically acceptable, and would be a preferable alternative to an undisguised facility.

4. Tall structures located atop or within existing buildings or structures may result in an overall increase in height of the structure of no more than ten (10) percent of the structure's height without the facility or the maximum height allowed in the zoning district in which the structure is located, whichever is less.

D. Signage.

1. Tall structures must contain a sign no larger than four (4) square feet with text in a sufficient font size to provide adequate notification to persons in the immediate area of the presence of an antenna that has transmission capabilities. The sign shall contain:

a. The name(s) of the owner(s) and operator(s) of the facility;

b. An emergency phone number(s), and FCC registration number, if applicable;

c. Information for the purpose of identifying the tower such as the antenna structure registration number required by the FCC;

d. The party responsible for the operation and maintenance of the facility; and

e. A twenty-four- (24-) hour emergency contact number.

2. The sign must be on the equipment shelter or cabinet and be visible from the access point of the site. The sign must not be lighted unless authorized by the city or unless applicable provisions of law require such lighting.

3. No other signage is permitted on any tall structure unless required by law.

4. No advertising is permitted on any facility with the exception of identification signage.

5. If more than two hundred twenty (220) volts are necessary for the operation of the facility, warning signs must be located at the base of the facility and must display in large, bold, high contrast letters the following: "HIGH VOLTAGE – DANGER."

6. Signs other than warning signs and those specifically required by this chapter are not allowed on tall structures.

E. Lighting.

1. Tall structures may not be lighted or marked unless required by the FCC or FAA.

2. Notice is required to be provided to the FAA, on a form prescribed by the FAA, if the facility falls under notification requirements mentioned in 14 C.F.R. Part 77. The applicant is responsible for determining whether notification is required. Any tall structure that is required to have lighting by the FAA will be lighted with the minimum intensity and number of flashes per minute (i.e., the longest duration between flashes) allowable by the FAA.

3. When lighting is required:

a. The lights must be oriented, shielded or otherwise designed so as not to project directly onto surrounding property, consistent with FAA requirements.

b. Tall structures must use non-strobe-type red lights for night air safety illumination unless otherwise required by law.

c. The negative impact across lot lines caused by tall structure lights and illumination on the site must be minimized.

d. Scenic and night sky views, traffic safety, enjoyment of residential and other lawful uses must be protected.

4. Additional conditions may be required for lighting: type, wattage, brightness, shrouds, direction, location, height and other buffers.

F. Design Criteria.

1. All freestanding tall structures between eighty (80) feet and one hundred twenty (120) feet in height must be engineered and constructed to accommodate no fewer than four (4) antenna arrays. All tall structures between one hundred twenty-one (121) feet and one hundred fifty (150) feet must be engineered and constructed to accommodate no fewer than five (5) antenna arrays. All tall structures one hundred fifty-one (151) feet and taller must be engineered and constructed to accommodate no fewer than six (6) antenna arrays.

2. All utilities for a tall structure site must be installed underground whenever possible and in compliance with all ordinances, rules and regulations of the city, including, but not limited to, the most current versions of the National Electrical Code, the National Electrical Safety Code, and Structural Standard for Antenna Supporting Structures and Antennas (EIA/TIA 222) where appropriate.

3. All appurtenant or associated facilities of a tall structure must maximize use of building materials, colors and textures designed to blend with the structure to which it may be affixed, or to harmonize with the natural surroundings or built environment, which must include the utilization of concealed or concealment technology for facilities appurtenant to concealed tall structures. If located in or abutting a residential, commercial or mixed-use district, the appurtenant or associated facility must be placed inside an enclosed structure, fenced and screened with sight-obscuring foliage, which will be as tall as the appurtenant or associated facility.

G. Setbacks. Freestanding towers and appurtenant structures shall be subject to the setbacks described below:

1. If the tower is not constructed using breakpoint design technology, the minimum setback distance from the nearest property line must be equal to the height of the proposed tower.

2. If the tower has been constructed using breakpoint design technology, the minimum setback distance must be equal to one hundred ten (110) percent of the distance from the top of the structure to the breakpoint level of the structure, or the minimum yard setback requirements, whichever is greater. For example, on a one-hundred- (100-) foot-tall freestanding tower with a breakpoint at eighty (80) feet, the minimum setback distance would be twenty-two (22) feet (one hundred ten (110) percent of twenty (20) feet, the distance from the top of the tower to the breakpoint) plus the minimum side or rear yard setback requirements for that zoning district. Certification, by a professional engineer registered in the state of Alaska, of the breakpoint design and the design's fall radius must be provided with the application.

3. Any appurtenant structure must be located so as to comply with the applicable minimum setback requirements for the property on which it is situated.

4. Guy, guy anchors, and accessory facilities must meet zoning district setback requirements.

5. Setbacks will be determined from the dimensions of the entire lot, even though the tall structure may be located on lease areas within the lot.

6. A variance from the setback requirement may be granted by the planning commission upon receipt of signed and duly notarized waivers by all adjoining property owners agreeing to such modification or waiver.

H. Parking. For all tall structures regulated under this chapter, vehicle parking must be provided on the subject property, outside of public use easements and rights-of-way to enable emergency vehicle access. No more than two (2) spaces per provider are required.

I. Equipment Shelters. No equipment shelter for a tall structure may exceed seven hundred fifty (750) square feet in area or twelve (12) feet in height. All such shelters must be screened with vegetation or other aesthetically pleasing materials. Furthermore, all such shelters must be secured with approved fencing and a locked gate.

J. Landscaping. The planning commission has the authority to impose reasonable landscaping requirements surrounding the tall structure and all accessory equipment. When landscaping is

required, existing mature tree growth and natural land on the site must be preserved to the greatest extent feasible.

K. Facility Color. The tall structure, facility and fence must be earth tone or natural colors that blend with the surrounding area, except when specific colors or color patterns are required by state or federal regulations.

L. Visibility.

1. Tall structures must be configured and located in a manner that minimizes adverse effects including visual impacts on the landscape and adjacent properties and must be maintained in accordance with the requirements of this chapter.

2. Tall structures must be designed to either resemble the surrounding landscape and other natural features where located in proximity to natural surroundings, or be compatible with the surrounding, built environment, through matching or complementing existing structures and specific design considerations such as architectural designs, height, scale, color, and texture.

3. Surrounding topography and development must be used to reduce negative impacts. Height above nearby ridge lines, hills, trees and buildings must be the minimum needed to reasonably conduct the use.

4. Aerial lines crossing parks, trails and water bodies must be minimized.

M. Structural Assessment. The owner of a freestanding tall structure shall have a structural assessment of the tower conducted by a professional engineer licensed in the state of Alaska if:

1. The tall structure is within the distance from the top of the structure to the breakpoint level of the structure from a dwelling, parking lot, playground, or right-of-way; or

2. If the tall structure was not constructed using breakpoint design technology and the tower is at a distance equal to the tower's height from a dwelling, parking lot, playground, or right-of-way.

The owner shall submit the structural assessment report required by this subsection, signed by the engineer who conducted the assessment, to the director by July first (1st) every fifth (5th) year from the date of issuance of the special use permit.

N. Ice and Wind. A professional engineer, licensed in the state of Alaska, must provide certification that the proposed tall structure, at a minimum, will withstand one-hundred- (100-) year return wind speed for the site and one-half (1/2) inch of solid radial ice. [Ord. 15-27 § 3.]

16.10.120 Additional operation standards for wind energy conversion systems.

In addition to the operation standards for new tall structures required by BMC 16.10.110, the following standards apply to wind energy conversion systems (WECS):

A. WECS must be equipped with an automatic over speed control device designed to protect the system from sustaining structural failure such as splintered or thrown blades and the overturning or breaking of towers due to an uncontrolled condition brought on by high winds; and

B. WECS must have a manually operable method that assures the WECS can be brought to a safe condition in high winds. Acceptable methods include mechanical or hydraulic brakes or tail vane deflection systems which turn the rotor out of the wind. [Ord. 15-27 § 3.]

16.10.130 General application submittal requirements.

A. An application for a tall structure must be signed by a person having knowledge of the contents of the application.

B. The landowner, if different than the applicant, must also sign the application.

C. All information submitted in an application must be provided by a person qualified and authorized to provide the information.

D. All applications for the construction or installation of a new tall structure must be accompanied by the following documentation:

1. A narrative describing compliance with BMC 16.10.110;

2. A copy of the deed showing ownership of the property, including book and page number where the deed is recorded with the Bethel recorder's office;

3. A copy of a written instrument (lease, sublease, memorandum, deed, etc.) demonstrating the applicant has secured the property owner's permission to use the property for placement and use of a tall structure, but such written instrument be redacted only as to financial compensation therein;

4. Evidence of legal access to the tower site and ability to maintain this access regardless of other developments that may take place on the site;

5. Copy of any recorded easements necessary to reach the tall structure site. Easements may not be less than twenty (20) feet in width with a road base not less than ten (10) feet in width;

6. The location of existing streets, buildings, transmission lines, sewers, culverts, drainpipes and easements to the extent that these may be ascertained from a field inspection of the property;

7. The general geographic information about the site including topography, proximity to surface waters, susceptibility to flooding, soil characteristics and other characteristics which might impose restrictions on the development of the site;

8. The applicant shall have prepared, by a registered land surveyor registered in the state of Alaska, a boundary survey, which must meet all requirements for recordation in the Bethel recorder's office;

9. A detailed development plan not less than eighteen (18) inches by twenty-four (24) inches drawn at a scale of sufficient size to accurately and clearly show all required information with a certifying signature, seal and date of a state of Alaska licensed engineer;

10. For wireless communication facilities (WCF), a signed statement from a qualified person, together with a statement of that person's professional qualifications, certifying that radio

frequency emissions from the antenna array(s), both individually and cumulatively considering any other WCF located on or immediately adjacent to the proposed WCF, will comply with FCC standards;

11. Certification from the state of Alaska licensed engineer regarding the proposed tall structure's ability to accommodate antennas from wireless communication providers;

12. The names and addresses of all adjoining property owners;

13. The name, address, email address, phone number and fax number of all persons preparing the application and any required submittals;

14. The name, address, phone number and fax number of the property owner, applicant, and facility owner, if applicable;

15. The name, title and contact numbers for persons in charge of the operation and who will be responsible for compliance with the permit;

16. An organizational chart or description identifying the lines of responsibility and general function of the organization that will own and operate the facility;

17. A description of all major types of activities proposed to occur on the site, including at a minimum the purpose, number, type and general performance specifications of all tall structures and antennas, on-site staffing, accessory structures, equipment (such as generators) and plans for collocation of other tall structures and antennas on the site;

18. A general description of the security and safety measures proposed to protect the public safety;

19. The zoning designation of the property on which the proposed tall structure will be situated;

20. The size of the property stated both in square feet and lot line dimensions, and a diagram showing the location of all lot lines;

21. The locations of any dwellings within a radius equal to the height of the proposed tower from its base;

22. The location, size and height of all structures on the property which are the subject of the application;

23. The location, size and height of all proposed and existing antennas and all appurtenant structures;

24. The type, locations and dimensions of all proposed and existing landscaping and fencing;

25. A detailed description of the proposed tall structures and all related fixtures, structures, appurtenances and apparatus, including height above preexisting grade, materials, color and lighting;

26. Design drawings for the proposed tall structure, drawn to scale, and certified by a registered engineer licensed in the state of Alaska; and

27. Certification that the application is in compliance with all applicable laws pertaining to the type of service offered.

E. In addition to the information required by BMC 16.10.050(B), an affidavit demonstrating compliance with BMC 16.10.050. If a lower ranking alternative is proposed, the applicant shall include a separate affidavit demonstrating why higher ranked options are technically infeasible or commercially impracticable given the proposed location of the tall structure. Such narrative must be accompanied by an affidavit by an engineer licensed in the state of Alaska.

F. Applicant shall disclose in writing the existence of any agreement that would limit or preclude the ability of the applicant to share any new tall structure that it constructs.

G. Applicant shall furnish written certification by a professional engineer, licensed in the state of Alaska, that the tall structure, foundation and appurtenant attachments are designed to meet relevant site and subsurface conditions.

H. For WCF, applicant shall furnish written certification by a professional engineer, licensed in the state of Alaska, that the tall structure will be constructed to meet the most current published version of EIA/TIA 222 (as amended) and local building code structural requirements for loads, including wind, snow and ice loads for the specified number of collocations.

I. Applicant shall file a copy of a determination of no hazard to air navigation from the FAA.

J. If breakpoint technology is intended to be utilized, a written statement specifying the height at which the engineered structural weakness will be located.

K. Proof of compliance with FAA regulations in 14 C.F.R. Part 77, if applicable.

L. All applications must have an attestation clause requiring the applicant to attest to the truth and completeness of the information provided in the application. [Ord. 15-27 § 3.]

16.10.140 Planning director's review.

A. The planning director shall review the application for completeness and shall notify the applicant within twenty (20) calendar days of receipt of the initial submission whether the application is deemed complete.

B. Incomplete applications will be rejected, in writing, within thirty (30) calendar days of receipt of the initial submission. If rejected, the director's decision must identify the deficiencies in the application, which, if cured, would make the application complete.

C. Once an application is deemed complete, the planning director shall schedule it for a hearing before the planning commission and shall give notice to the applicant and the public in accordance with subsection D of this section.

D. Public Notice. Public notice of planning commission consideration of a special use permit request for a new tall structure, at a minimum, shall be provided as follows:

1. Permit consideration must be included as an item in the posted agenda.

2. Notice of the hearing and the agenda item must be published in a newspaper of general circulation in the city a minimum of ten (10) calendar days prior to the date of the meeting. The cost of publication will be paid by the applicant. Publication will be accomplished by the planning director.

3. The planning director, or their designee, shall post copies of the agenda showing the request for a special use permit, on at least three (3) bulletin boards accessible to the general public. Posting will be completed at least five (5) calendar days prior to the scheduled hearing.

4. The applicant shall post signs on the proposed site at least fourteen (14) calendar days prior to the hearing at locations determined by the planning director. The sign must be between four (4) square feet and thirty-two (32) square feet in area, must have a red background, and must indicate in white lettering, two-hundred-sixteen- (216-) point or larger, that a special use permit for a tall structure has been sought for the site, the date of the hearing thereon, and that further information is available from the city's planning director. The applicant must maintain the sign and shall remove it within fourteen (14) calendar days after final action on the application.

5. The planning director shall mail notice of the application and the public hearing to the owners of record of all property located within one thousand five hundred (1,500) feet of the site and all individuals who submitted comments at the community meeting. The actual cost of mailing will be paid by the applicant. [Ord. 15-27 § 3.]

16.10.150 Planning commission review.

The planning commission is authorized to review, analyze, evaluate and make decisions with respect to reviewing special use permits for tall structures.

A. Process Timeframe.

1. A public hearing must be held by the planning commission within forty-five (45) calendar days of receipt of a complete application;

2. The commission shall render a written decision within thirty (30) days from the close of the public hearing.

B. The planning commission may impose conditions on a tall structure permit:

1. Required to ensure compliance with the design criteria specified in BMC 16.10.110; and

2. That are consistent with the purposes of this chapter, which may include conditions related to the aesthetic effect of the tall structure and compatibility with the surrounding area. Factors relevant to aesthetic effects are:

a. The protection of the view in sensitive or particularly scenic areas;

b. The concentration of tall structures in the proposed area; and

c. Whether the height, design, placement or other characteristics of the proposed facility could be modified to have a less intrusive visual impact.

3. Conditions for Approval. Conditions set by the planning commission for a special use permit may include, but are not limited to, the following:

a. Height limitations;

b. Increased height or structural capacity of a proposed tall structure to accommodate future collocation;

c. Mitigation of drainage concerns;

d. Tower type (monopole, lattice, guyed);

e. Color;

f. Landscaping;

g. Parking;

h. Screening;

i. Security;

j. Signage;

k. Visibility and/or camouflaging;

l. Lighting;

m. Setbacks greater than those required under the applicable zoning regulations; and

n. Any other conditions deemed appropriate to protect the public health, safety and general welfare.

C. The planning commission may deny an application for any of the following reasons:

1. Conflict with safety and safety-related code or requirement;

2. Conflict with the purpose of a specific zoning, overlay, or land use designation;

3. Presence of another approved tall structure or tall structure application within the geographic search area, which is available to the applicant;

4. The proposed site is on, or eligible to be on, the National Register of Historic Places;

5. The applicant's failure to demonstrate that no existing structure or tower can accommodate the applicant's proposed use without increasing the height of another existing tower or structure

or otherwise creating a greater visual impact; or that use of other existing facilities is technically infeasible or commercially impracticable; and

6. Conflicts with the provisions of this article.

D. The planning commission shall deny any application for a tall structure in the following locations:

1. State or local wildlife refuges; and

2. In any area designated as a public park, unless screened so as to minimize visual and noise impacts, and as long as public use of the public park will not be disrupted.

E. Any and all representations made by the applicant to the planning commission on the record during the application process, whether written or verbal, will be deemed a part of the application and may be relied upon in good faith by the planning commission.

F. In granting or denying a special use permit, the planning commission shall make written findings on whether the applicant has demonstrated that:

1. The location chosen complies with the location preferences set out in BMC 16.10.050;

2. To the extent that is technically feasible and potentially available, the location of the tall structure is such that its negative effects on the visual and scenic resources of all surrounding properties have been minimized;

3. The tall structure will not interfere with the approaches to any existing airport or airfield; and

4. Granting the permit will not be harmful to the public health, safety, convenience, and welfare.

G. The planning commission's decision shall be in writing and must include written findings of fact contained in the administrative record, including without limitation any oral evidence presented at a public hearing for the tall structure.

H. If the planning commission denies a request to place, construct or modify a tall structure, the applicant may, within fifteen (15) calendar days from the postmarked date of the decision, appeal the planning commission's decision in accordance with BMC 16.10.270. [Ord. 15-27 § 3.]

16.10.160 Extent and parameters of special use permits.

A. A holder of a special use permit granted under this chapter shall obtain, at its own expense, all permits and licenses required by applicable law, rule, regulation or code, and must maintain the same, in full force and effect, for as long as required by the city and other governmental entity or agency having jurisdiction over the applicant.

B. Within ten (10) calendar days from the issuance of a special use permit, the holder shall file with the planning director a written indemnification of the city and proof of liability insurance or financial ability to respond to claims up to one million dollars ($1,000,000) in the aggregate which may arise from operation of the facility during its life. The city will not bear any cost for the holder's required insurance. Proof of insurance must be maintained throughout the life of the tall structure.

C. A special use permit will become void six (6) months after its effective date if no substantial construction progress has been made. A new application must be submitted for a voided permit, including new payment of any required fees, and a new permit obtained. No permit may be renewed more than once. The maximum duration of permit and one renewal shall be twelve (12) months from the date of issuance of the original permit.

D. Upon an application submitted at least thirty (30) days before the expiration of an existing special use permit, the planning commission shall hold a hearing to consider whether the permit should be extended. Notice of said hearing will be provided in accordance with the procedures set out in BMC 16.10.140(D). At the hearing, the burden of proof for the justification for a permit extension shall rest with the applicant. Upon written findings that such burden has been met, the planning commission may grant an extension the maximum duration of which shall not exceed twelve (12) months. The planning commission may not delete from, amend or add to the conditions contained in the original permit. Upon written findings that the applicant's burden has not been met, or that the conditions contained in the permit should be changed, or both, the commission shall deny the application whereupon the permit shall be voided.

E. The property owner and the permittee shall be responsible for maintaining all aspects of the operation, improvements, development, and site in compliance with the terms and conditions of the permit and all applicable local, state and federal requirements.

F. The holder of a special use permit shall notify the city of any intended modification of a tall structure and shall apply to the planning director prior to modifying, relocating or rebuilding any tall structure.

G. Following prior written notice to the applicant and a hearing on the matter, special use permits may be revoked, canceled or terminated for a violation of the conditions and provisions of the special use permit for tall structures or for a material violation of this chapter. [Ord. 15-27 § 3.]

16.10.170 Interference with public safety equipment.

In order to facilitate the regulation, placement, and construction of antenna, and to ensure that all parties are complying to the fullest extent possible with the rules, regulations, and/or guidelines of the FCC, each WCF applicant or owner applicant shall agree in a written statement to the following:

A. Compliance with "good engineering practices" as defined by the FCC in its rules and regulations;

B. Compliance with FCC regulations regarding susceptibility to radio frequency interference, frequency coordination requirements, general technical standards for power, antenna, bandwidth limitations, frequency stability, transmitter measurements, operating requirements, and any and all other federal statutory and regulatory requirements relating to radio frequency interference (RFI);

C. In the case of an application for collocated telecommunications facilities, the applicant, together with the owner of the subject site, shall use their best efforts to provide a composite analysis of all users of the site to determine that the applicant's proposed facilities will not cause radio frequency interference with the city's public safety communications equipment and will implement appropriate technical measures, as described in antenna element replacements, to attempt to prevent such interference; and

D. Whenever the city has encountered radio frequency interference with its public safety communications equipment, and it believes that such interference has been or is being caused by one (1) or more antenna arrays, the following steps may be taken:

1. The city will provide notification to all wireless service providers operating in the city of possible interference with the public safety communications equipment, and upon such notifications, the owners shall use their best efforts to cooperate and coordinate with the city among themselves to immediately investigate and mitigate the interference, if any, utilizing the procedures set forth in the joint wireless industry – public safety "Enhanced Best Practices Guide," released by the FCC in Appendix D of FCC 04-168 (released August 6, 2004, or most recent edition), including the "Good Engineering Practices," as may be amended or revised by the FCC from time to time in any successor regulations.

2. If any equipment owner fails to cooperate with the city in complying with the owner's obligations under this section or if the FCC makes a determination of radio frequency interference with the city's public safety communications equipment, the owner who failed to cooperate and/or the owner of the equipment which caused the interference shall be responsible, upon FCC determination of radio frequency interference, for reimbursing the city for all costs associated with ascertaining and resolving the interference, including but not limited to any engineering studies obtained by the city to determine the source of the interference. For the purposes of this subsection, failure to cooperate shall include failure to initiate any response or action as described in the "Enhanced Best Practices Guide" within seventy-two (72) hours of the city's notification. [Ord. 15-27 § 3.]

16.10.180 Transfers and assignments.

A. Permits obtained pursuant to this chapter may not be assigned or transferred without providing prior written notice to the city, on a form acceptable to the planning director.

B. In the event a WCF provider or owner transfers ownership of a WCF to a different provider or owner, the previous and new service provider or owner shall notify the planning director no less than ten (10) calendar days from the date of transfer. The new provider or owner shall include the name, address and phone number of the person to be responsible for the WCF. [Ord. 15-27 § 3.]

16.10.190 Network improvement permit.

A. A network improvement permit allows legally constructed tall structures to be replaced or modified in a manner that increases the overall height of the existing tall structure in accordance with this section.

B. A network improvement permit does not require notification to surrounding property owners.

C. The base of a replacement tower may be located no farther than fifty (50) feet from the base of the original tower. The original tower shall be removed within ninety (90) calendar days upon completion of construction of the replacement tower.

D. More than one (1) network improvement permit may be obtained. However, the cumulative increase in overall height may not exceed the following:

1. Up to twenty (20) feet for telecommunications towers that are located within a residential district. If the existing tower exceeds two hundred (200) feet, it can be increased by up to ten (10) percent of the height of the existing tower;

2. Within a residential district, height increase under this section is limited to a cumulative increase of ten (10) percent of the existing facility unless the applicant demonstrates that the additional height, not to exceed twenty (20) feet, is necessary for installation of one (1) additional antenna array.

E. Application for a network improvement permit must include the following:

1. Application form signed by the property owner and authorized agent for the tall structure;

2. A description of the proposed modifications to the tall structure, including a description of the height, type, and lighting of the new or modified structure and the existing structure; and

3. Design drawings for the proposed modified or replaced structure, drawn to scale, and certified by a registered engineer licensed in the state of Alaska.

F. In granting a network improvement permit, the planning director shall make the following findings:

1. That the proposed development conforms to setback requirements of BMC 16.10.110;

2. That the tall structure being extended was lawfully constructed at the time of application for a network improvement permit; and

3. That the proposed modification does not violate permit conditions of any valid permits that have been issued to the existing facility.

G. A network improvement permit must be approved within sixty (60) calendar days from the time of application if it meets the requirements of this section.

H. Replacement or modification of a tall tower that is in accordance with this section is not subject to application or preapplication requirements required for a new tower under this chapter. [Ord. 15-27 § 3.]

16.10.200 Reconstruction and replacement.

A. This section only applies to tall structures that are legally permitted or are recognized by the city as having obtained preexisting legal nonconforming status.

B. The tower operator is responsible for all aspects of the operation, improvements, development, and maintenance of the site in compliance with the terms and conditions of the permit and all applicable local, state, and federal requirements.

C. Tall structures may be replaced or reconstructed in order to improve the structural integrity of the tall structure or in the case of accidental damage or collapse.

D. Reconstruction or replacement shall not:

1. Increase lighting;

2. Change the type of lighting;

3. Change the tower type;

4. Change the location of the tall structure; or

5. Increase the height of a tall structure.

E. In the case of accidental damage or collapse, if reconstruction or replacement has not commenced within six (6) months from the date of the damage, the structure is considered to be abandoned and is subject to BMC 16.10.210.

F. Reconstruction or replacement must conform to all the requirements and conditions of a previously granted permit or preexisting legal nonconforming determination. [Ord. 15-27 § 3.]

16.10.210 Nonuse and abandonment.

A. Notwithstanding the emergency powers of the city, the planning director may require removal of a tall structure under the following circumstances, which are deemed detrimental to the health, safety, and welfare interests of the city:

1. Tall structures with a permit that have not been used as a tall structure for a period exceeding sixty (60) consecutive days or a total of one hundred eighty (180) calendar days in any three-hundred-sixty-five- (365-) day period, except for periods caused by force majeure or acts of God, in which case, repair or removal shall commence within ninety (90) calendar days.

2. Permitted tall structures that have fallen into such a state of disrepair that they create a public health or safety hazard, which shall be deemed a nuisance per se.

3. Tall structures that have been located, constructed or modified without first obtaining all permits required by law, or that have been located, constructed or modified in a manner inconsistent with the applicable permit requirements, which shall be deemed a nuisance per se.

B. If the planning director makes such a determination as noted in subsection A of this section, the planning director shall notify the permittee in writing that said tall structure is to be removed. Notification shall be deemed completed when notice is mailed, certified mail, return receipt, to the last known address on file.

C. Within ninety (90) days of the postmarked date of the planning director's notice, the permittee, or its successors or assigns, at its sole expense, shall dismantle and remove such tall structure (and all associated structures and facilities) from the site and restore the site as close to its original condition as is possible. Restoration being limited only by physical or commercial impracticability proven to the satisfaction of the planning director.

D. If the tall structure owner cannot be found, the landowner will be notified and will become responsible for removal of the unused structures.

E. If the tall structure is not removed within ninety (90) days after the permit holder and/or landowner have received notice, the city may remove or cause to be removed the tall structure at the sole expense of the owner, permit holder and landowner.

F. Notwithstanding anything in this section to the contrary, the planning director may approve a temporary use permit/agreement for the tall structure, for no more than ninety (90) calendar days, during which time a suitable plan for removal, conversion or relocation of the affected tall structure shall be developed by permit holder or owner, subject to the approval of the planning director. If such a plan is not developed, approved and executed within the ninety- (90-) day time period, then the city may take possession of and dispose of the affected tall structure in the manner provided in this section. [Ord. 15-27 § 3.]

16.10.220 Removal of facilities.

A. The owner of a facility shall establish a ten-thousand-dollar ($10,000) cash security fund or provide the city with an irrevocable letter of credit in the same amount to secure the cost of removing the tall structure and all appurtenances once abandoned.

B. In the event of a transfer of ownership, the seller shall be responsible for notifying the buyer of this requirement and for notifying the city of the transfer.

C. In the event of a transfer of ownership, the city will not refund the security to the initial owner until the new owner of the tall structure posts the required ten-thousand-dollar ($10,000) security or letter or irrevocable letter of credit. [Ord. 15-27 § 3.]

16.10.230 Transfer of a conditional use permit.

The privileges and requirements of a permit issued under this chapter shall run with the land, but shall terminate without right of reactivation if the permit is revoked or abandoned as provided herein. [Ord. 15-27 § 3.]

16.10.240 Tall structures in existence or under construction on the date of adoption of this chapter.

A. All tall structures greater than one hundred (100) feet must be registered with the city within ninety (90) calendar days of the adoption of this chapter.

B. All existing tall structures must be brought into compliance with the signage and security fencing requirements of this chapter (BMC 16.10.110) within one hundred eighty (180) calendar days of the adoption of this chapter.

C. Tall structures which have commenced construction or are in existence as of the effective date of the ordinance codified in this chapter, but which would otherwise be prohibited, regulated or restricted under this chapter, are allowed to continue subject to the provisions set out in this section.

1. Structures which have commenced construction as of the date of adoption of this chapter are allowed to be constructed. The height of the structures one (1) year after the date of adoption of this chapter shall be considered the final height of the structure. Such structures may only be expanded in accordance with a permit under this chapter.

2. Existing or proposed structures which have been granted a special use permit under BMC 16.10.100 and other related sections of this chapter are considered to have preexisting legal nonconforming status and are allowed to continue in accordance with the requirements of the permit but shall not be increased in height except as provided in this chapter.

3. Structures which are existing as of the date of adoption of this chapter are eligible for preexisting legal nonconforming status under this chapter.

4. All telecommunications towers greater than eighty (80) feet shall comply with operations standards required by BMC 16.10.110.

D. Alteration or modification of greater than thirty (30) percent of existing tall structure, or an increase in height to an existing tall structure, will void its "grandfather" status, and all elements of this chapter will apply.

E. Nonconforming tall structures which have commenced construction or are in existence as of the date of this chapter are eligible for preexisting legal nonconforming status upon submittal of the following:

1. Name, title, and contact numbers of the landowner, applicant, and persons in charge of the operation;

2. Height of structure;

3. Legal description of the subject parcel;

4. A certified site plan;

5. Documentation of all signage within the equipment compound;

6. Documentation demonstrating that the structure was in existence or had commenced construction prior to the date of adoption of this chapter; and

7. Certified written assurance by the owner of the tall structure that they intend to take responsibility for the safe and proper removal of the tall structure when it ceases to be used for its intended purpose.

F. Within fifteen (15) calendar days of submittal, the planning director shall issue a determination of incompleteness if the application fails to meet the requirements of this chapter. Rejection of the application for preexisting legal nonconforming status shall be in writing and shall state the deficient items. Once the deficiencies are corrected, the application shall be accepted as complete.

G. Preexisting legal nonconforming status will be determined based on the following:

1. Whether the applicant has demonstrated that the tall structure was constructed or construction had commenced legally under the applicable code provisions at the time, if any. [Ord. 15-27 § 3.]

16.10.250 Conflict with other ordinances.

Where any provision of this chapter differs or conflicts with other ordinances, unless the right to do so is preempted or prohibited by state or federal law, the more restrictive or protective of the city and the public shall apply. [Ord. 15-27 § 3.]

16.10.260 Violations, enforcement and penalties.

A. Any person violating the provisions of this chapter may be guilty of a minor offense punishable by a fine of one thousand dollars ($1,000) per day.

B. Additionally, the city may utilize any other provisions of law available to it in order to enforce the provisions of this chapter, including, but not limited to, injunction and abatement.

C. Every day there is a violation of this chapter shall be considered a unique and separate offense.

D. In addition to other applicable penalties, failure to correct the violation of code, after reasonable notice, may result in revocation of the permit.

E. Complaints received by the city of violations of state or federal law will be forwarded to the appropriate agency for enforcement.

F. Authorized representatives of the city are allowed to inspect the site and related records at reasonable times for the purpose of monitoring compliance with all permit conditions.

G. The permittee shall assist and cooperate with authorized inspections upon reasonable notice from the city. [Ord. 15-27 § 3.]

16.10.270 Appeals – In general.

A. An applicant desiring relief, waiver or exemption from any aspect or requirement of this chapter may request same. Such relief may be temporary or permanent, partial or complete. However, the burden of proving the need for the requested relief, waiver or exemption is solely on the applicant to prove.

B. No such relief or exemption will be granted unless the applicant demonstrates that, if granted, the relief, waiver or exemption will have no significant adverse effect on the health, safety and welfare of the city of Bethel, its residents and other service providers.

C. Denials of relief requested must be appealed as follows:

1. Decisions of the planning director may be appealed to the planning commission.
2. Decisions of the planning commission may be appealed to the city manager.
3. Decisions of the city manager may be appealed to a hearing officer.
4. Decisions of the hearing officer(s) are final. [Ord. 15-27 § 3.]

16.10.280 Appeals to the planning director.

A. A request for relief or reconsideration to the planning director is a more informal process and should be accomplished by a written letter. The applicant's request for relief must address the following:

1. The type of relief sought;

2. The basis for granting said relief;

3. The length of the requested relief (temporary, permanent, partial or complete);

4. Any other information the applicant feels is relevant for the planning director to review;

5. The name and contact information for the person seeking relief.

B. The request for relief to the planning director must be clearly labeled "Request for Relief."

C. The planning director shall impartially review the request for relief and shall issue a written decision within twenty (20) calendar days after receipt of the request for relief. The request for relief must state:

> This is the final decision of the City planner. This decision may be appealed to the Planning Commission. If you appeal, you must file a written notice of appeal with the City Clerk within fourteen (14) calendar days after this final decision is sent.

D. There is no fee for filing a request for relief to the planning director. [Ord. 15-27 § 3.]

16.10.290 Appeals to the planning commission.

A. An applicant may appeal a final decision of the planning director by filing a written request for appeal with the planning director within fourteen (14) calendar days after notice of the planning director's decision is sent.

B. When filing the appeal, the appellant shall:

1. Certify under oath that the appeal is made in good faith;

2. Set forth the pertinent sections of the Bethel Municipal Code and/or state or federal law which the appellant believes were misapplied or misinterpreted by the city;

3. Set forth the specific relief requested.

C. The planning director shall forward the request for appeal to the planning commission who shall set the appeal for the next regularly scheduled planning commission meeting, provided such meeting is scheduled sufficiently in the future to allow for proper notification as required under the Bethel Municipal Code. If the request is received too close to a scheduled planning commission meeting that proper notice would not be possible, the planning commission shall set the matter for the following meeting.

D. Written notice of the hearing shall be sent to the applicant and any other interested parties by the planning director.

E. Prior to the hearing, the planning director shall make copies of the request for relief submitted by the applicant as well as the planning director's decision.

F. Applicants may supplement the information provided to the planning commission by providing additional information previously presented to the planning director. Supplemental information must be provided to the planning director at least ten (10) days prior to the hearing.

G. During an appeal to the planning commission, appellant may not rely on or introduce information that the appellant failed to furnish to the city in support of its initial request.

H. Before issuing a written decision, the planning commission shall hear from the parties and shall review the facts and documents relating to the claim.

I. Within thirty (30) days of the hearing, the planning commission shall issue a written decision. The decision must include the following statement:

> This is the final decision of the Planning Commission. This decision may be appealed to the City Manager. If you appeal, you must file a written notice of appeal with the City Clerk within fourteen (14) calendar days after you receive this decision.

J. The planning director shall furnish a copy of the planning commission's decision to the appellant by certified mail or other method that provides evidence of receipt.

K. There is no fee for filing a request for relief to the planning director. [Ord. 15-27 § 3.]

16.10.300 Appeals to the city manager.

A. An applicant may appeal a final decision of the planning commission by filing a written request for appeal with the city clerk within fourteen (14) calendar days after the planning commission's decision is sent.

B. When filing the appeal, the appellant shall:

1. Certify under oath that the appeal is made in good faith;

2. Set forth the pertinent sections of the Bethel Municipal Code and/or state or federal law which the appellant believes were misapplied or misinterpreted by the city;

3. Set forth the specific relief requested;

4. An appeal to the city manager must be accompanied by a filing fee as set out in the Bethel fee and rate schedule.

C. If the appeal request does not meet the requirements of subsections A and B of this section, it shall be denied.

D. During an appeal under this chapter, the appellant may not rely on or introduce information that the appellant has failed to furnish to the city in support of its initial request.

E. Before issuing a written decision, the city manager shall review the facts relating to the claim and obtain necessary assistance from legal and other relevant advisors.

F. The city manager's decision will be limited to a review of the file and all documents presented and accepted to date. No argument will be heard by the city manager.

G. The city manager shall furnish a copy of their decision to the appellant by certified mail or other method that provides evidence of receipt. The decision must include:

1. A description of the claim;

2. A reference to the pertinent BMC provisions;

3. A statement of the agreed-upon and disputed facts;

4. Findings of fact about the claim;

5. A statement of reasons supporting the decision; and

6. A statement substantially as follows:

This is the final decision of the City Manager. This decision may be appealed to a Hearing Officer. If you appeal, you must file a written notice of appeal with the City Clerk within fourteen (14) calendar days after you receive this decision.

[Ord. 15-27 § 3.]

16.10.310 Appeals to the hearing officer(s).

A. An applicant may appeal a final decision of the city manager by filing a written request for appeal with the city clerk within fourteen (14) calendar days after the city manager's decision is sent.

B. When filing the appeal, the appellant shall:

1. Certify under oath that the appeal is made in good faith;

2. Set forth the pertinent sections of the Bethel Municipal Code and/or state or federal law which the appellant believes were misapplied or misinterpreted by the city;

3. Set forth the specific relief requested;

4. An appeal to the hearing officer(s) must be accompanied by a filing fee as set out in the Bethel fee and rate schedule.

C. If the appeal request does not meet the requirements of subsections A and B of this section, it shall be denied.

D. During an appeal under this chapter, the appellant may not rely on or introduce information that the appellant has failed to furnish to the city in support of its initial request.

E. The hearing officer(s) shall arrange for a prompt hearing and notify the parties, in writing, of the time and place of the hearing. The hearing may be conducted in an informal manner.

F. The hearing officer(s) may:

1. Hold prehearing conferences to settle, simplify, or identify the issues in a proceeding, or to consider other matters that may aid in the expeditious disposition of the proceeding;

2. Require parties to state their positions concerning the various issues in the proceeding;

3. Require parties to produce for examination those relevant witnesses and documents under their control;

4. Rule on motions and other procedural matters;

5. Regulate the course of the hearing and conduct of the participants;

6. Establish time limits for submission of motions or memoranda;

7. Impose appropriate sanctions against a person who fails to obey an order of the hearing officer, including:

a. Prohibiting the person from asserting or opposing designated claims or defenses or introducing designated matters into evidence;

b. Excluding all testimony of an unresponsive or evasive witness; and

c. Excluding a person from further participation in the hearing;

8. Take official notice of a material fact not appearing in evidence, if the fact is among the traditional matters subject to judicial notice;

9. Administer oaths or affirmations;

10. Exclude witnesses when not testifying.

G. The parties shall have the right:

1. To present witnesses and evidence; and

2. To cross-examine opposing witnesses and rebut evidence.

H. The hearing will be open to the public.

I. The hearing shall be recorded. A transcribed record of the hearing shall be made available at cost to the party that requests it.

J. The hearing officer(s) shall review the city manager's decision using a preponderance of evidence standard with the burden of proof on the claimant. [Ord. 15-27 § 3.]

16.10.320 Determination after hearing.

A. The hearing officer(s) decision will be written findings of fact and conclusions of law and will be made within thirty (30) calendar days of the end of the hearing.

B. The decision shall include a statement substantially as follows:

This is the final decision of the hearing officer(s). This decision may be appealed to a court. If you appeal, you must commence your lawsuit in the Superior Court for the State of Alaska at Bethel within thirty (30) calendar days after your receipt of this decision.

C. The hearing officer(s) shall deliver the written decision to the city clerk, who shall serve the written decision on the parties by fax and by mail.

D. Appeal to Superior Court. An appeal may be made from the written decision of the hearing officer (s) pursuant to the Alaska Rules of Appellate Procedure to the Superior Court for the state of Alaska at Bethel only. [Ord. 15-27 § 3.]

16.10.330 Section 6409(a) collocations and modifications.

A. Purpose.

1. The purpose of this section is to reasonably regulate, to the extent permitted under Alaska and federal law, collocations and modifications to existing wireless towers and base stations that do not substantially change the physical dimensions of such existing wireless towers or base stations consistent with Section 6409(a) of the Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. No. 112-96, 126 Stat. 156 (codified as 47 U.S.C. § 1455(a)), as may be amended, and 47 C.F.R. § 1.40001 et seq., as may be amended, to protect and promote the public health, welfare and safety within the city. This section accomplishes those purposes by establishing a clear and orderly streamlined application and review process that distinguishes those collocations and modifications over which the city may exercise its traditional zoning authority from those collocations and modifications over which federal law has preempted the city's traditional zoning authority. In doing so, the regulations in this section balance the city's legitimate government interest in well-planned development projects with the benefits that flow from robust wireless services.

2. This section does not intend to, and must not be interpreted or applied to:

a. Actually or effectively prohibit personal wireless services; or

b. Unreasonably discriminate among providers of functionally equivalent personal wireless services; or

c. Regulate the installation, operation, collocation, modification or removal of wireless facilities on the basis of the environmental effects of RF emissions to the extent that such emissions comply with all applicable FCC regulations; or

d. Prohibit or effectively prohibit any collocation or modification that the city may not deny under Alaska or federal law; or

e. Allow the city to preempt any applicable Alaska or federal law.

B. Permits Required. All projects submitted for review under this section will be subject to review and approval or denial by the planning director in accordance with this section.

1. Permit Application. No permit may be granted pursuant to this section or deemed granted by the operation of law unless the applicant first submits a written permit application in accordance with this subsection B.

2. Submittal Appointments Required. All permit applications must be submitted to the city at a prescheduled appointment. Applicants may submit one (1) permit application per appointment but may schedule successive appointments for multiple applications whenever determined feasible by the city. City staff will endeavor to provide applicants with an appointment within approximately five (5) business days after a request.

3. Authorization to Develop and Update Application Materials. The city authorizes and directs the planning director to develop and make publicly available permit applications and other materials specific for wireless facilities and without further authorization from city to update and amend such publicly available permit applications and materials from time to time as the planning director deems necessary or appropriate.

4. Required Application Materials. In addition to all other materials that the planning director may from time to time require pursuant to subsection (B)(3) of this section, all permit applications for permits granted under this section must include the following:

a. Application Fee. The applicable application fee established by city resolution.

b. Required Licenses or Approvals. Evidence that the applicant holds all current licenses and registrations from the FCC and any other applicable regulatory bodies where such license(s) or registration(s) are necessary to provide wireless services utilizing the proposed wireless facility. For any conditional approval(s) associated with the wireless facility, the applicant must submit copies of all conditions of approval.

c. Site Development Plans. A fully dimensioned site plan and elevation drawings prepared and sealed by an engineer licensed in the state of Alaska showing any existing wireless facilities with all existing transmission equipment and other improvements, including all utilities, and the legal boundaries of the leased and owned area surrounding the proposed facility and any associated access or utility easements.

d. Equipment Specifications. Specifications that show the height, width, depth and weight for all proposed equipment.

e. Photo Simulations. Photo simulations that show the proposed facility in context of the site from reasonable line-of-sight locations from public streets or other adjacent viewpoints, together with a map that shows the photo location of each photograph and the view angle to the proposed site from that photo location.

f. Written Narrative Analysis. A written statement that explains in plain factual detail whether and why Section 6409(a) and the related FCC regulations at 47 C.F.R. § 1.40001 et seq. require approval for the specific project. A complete written narrative analysis will state the applicable standard and all the facts that allow the city to conclude the standard has been met – bare conclusions not factually supported do not constitute a complete written

analysis. As part of this written statement, the applicant must also include (i) whether and why the support structure qualifies as an existing tower or existing base station; and (ii) whether and why the proposed collocation or modification does not cause a substantial change in height, width, excavation, equipment cabinets, concealment or permit compliance.

g. RF Exposure Compliance Report. A radio frequency (RF) report prepared and certified by an RF engineer acceptable to the city that certifies that the proposed facility, as well as any collocated facilities, will comply with applicable federal RF exposure standards and exposure limits. A professional electrical engineer licensed in the state of Alaska is deemed acceptable to the city. The RF report must include the actual frequency and transmission power levels (in watts ERP) for all existing and proposed antennas at the site regardless of antenna ownership and exhibits that show the location, transmission azimuth, and height of all transmitting antennas and the boundaries of areas with RF exposures in excess of the uncontrolled/general population limit (as that term is defined by the FCC) and also the boundaries of areas with RF exposures in excess of the controlled/occupational limit (as that term is defined by the FCC). Each such boundary shall be clearly marked and identified for every transmitting antenna at the project site regardless of antenna ownership.

C. Permit Approvals or Denials.

1. Findings for Approval. The planning director may approve a permit submitted for review under this section when the planning director finds that the proposed collocation or modification qualifies as an eligible facilities request and does not cause a substantial change.

2. Grounds for Denial. In addition to any other alternative recourse permitted under federal law, the planning director may deny a permit submitted for review under this section when that person finds that the proposed collocation or modification:

a. Violates any legally enforceable and generally applicable law, regulation, rule or permit condition reasonably related to public health and safety; or

b. Involves a structure constructed or modified without all regulatory approvals required at the time of the construction or modification; or

c. Involves the replacement of the entire support structure; or

d. Does not qualify for mandatory approval under Section 6409(a) for any lawful reason.

3. Denials Are Without Prejudice. Any denial of a permit submitted for review under this section shall be without prejudice to the applicant or the proposed development. Subject to the application and submittal requirements in this chapter, the applicant may immediately resubmit a permit application for either a conditional use permit pursuant to Chapter 18.60 BMC or permit for a modified project that complies with this section.

D. Standard Permit Conditions. In addition to any conditions of approval specific to the project, every permit granted pursuant to this chapter must include the conditions of approval as follows:

1. Permit Term. This permit will automatically expire or terminate when the permit for the underlying site being collocated or modified expires or terminates, if ever. The grant of this permit does not extend the permit term for the underlying site being collocated or modified.

2. Code Compliance. The permittee shall at all times maintain compliance with all applicable federal, state and local laws, regulations and other rules.

3. Inspections – Emergencies. The city or its designee may enter onto the facility area to inspect the facility upon reasonable notice to the permittee. The permittee shall cooperate with all inspections. The city reserves the right to enter or direct its designee to enter the facility and support, repair, disable or remove any elements of the facility in emergencies or when the facility threatens imminent harm to persons or property.

4. Contact Information for Responsible Parties. The permittee shall at all times maintain accurate contact information for all parties responsible for the facility, which shall include a phone number, street mailing address and email address for at least one (1) natural person. All such contact information for responsible parties shall be provided to the planning director upon permittee's receipt of the planning director's written request, except in an emergency determined by the city when all such contact information for responsible parties shall be immediately provided to the planning director upon that person's verbal request.

5. Indemnities. The permittee and, if applicable, the nongovernment owner of the private property upon which the tower and/or base station is installed shall defend, indemnify and hold harmless the city, its agents, officers, officials and employees (a) from any and all damages, liabilities, injuries, losses, costs and expenses and from any and all claims, demands, lawsuits, writs of mandamus and other actions or proceedings brought against the city or its agents, officers, officials or employees to challenge, attack, seek to modify, set aside, void or annul the city's approval of the permit, and (b) from any and all damages, liabilities, injuries, losses, costs and expenses and any and all claims, demands, lawsuits or causes of action and other actions or proceedings of any kind or form, whether for personal injury, death or property damage, arising out of or in connection with the activities or performance of the permittee or, if applicable, the private property owner or any of each one's agents, employees, licensees, contractors, subcontractors or independent contractors. Further, permittees shall be strictly liable for interference caused by their facilities with the city's communications systems. The permittee shall be responsible for costs of determining the source of the interference, all costs associated with eliminating the interference, and all costs arising from third party claims against the city attributable to the interference. In the event the city becomes aware of any such actions or claims, the city shall promptly notify the permittee and the private property owner and shall reasonably cooperate in the defense. It is expressly agreed that the city shall have the right to approve the legal counsel providing the city's defense, which approval shall not be unreasonably withheld, and the property owner and/or permittee (as applicable) shall reimburse city for any costs and expenses directly and necessarily incurred by the city in the course of the defense. Legal counsel shall not settle, compromise, waive or abandon any claim without the express written consent of city.

6. Adverse Impacts on Adjacent Properties. Permittee shall undertake all reasonable efforts to avoid undue adverse impacts to adjacent properties and/or uses that may arise from the construction, operation, maintenance, modification and removal of the facility.

7. General Maintenance. The site and the facility, including but not limited to all landscaping, fencing and related transmission equipment, must be maintained in a neat and clean manner and in accordance with all approved plans and conditions of approval.

8. Graffiti Removal. All graffiti on facilities must be removed at the sole expense of the permittee within forty-eight (48) hours after notification from the city.

9. No Waiver of Standing. The city's grant or grant by operation of law of this permit does not waive, and shall not be construed to waive, any standing by the city to challenge Section 6409 (a), any FCC rules that interpret Section 6409(a), including but not limited to 47 C.F.R. § 1.40001 et seq., or any permit granted pursuant to those laws and regulations.

E. Appeals. Subject to applicable federal timeframes for local review, accounting for any tolling, any person or entity may file a written appeal to the city to reverse the planning director's final decision to approve or deny without prejudice a permit application under this chapter. The appeal must state in plain terms the grounds for reversal and all facts that support those grounds. The appellant must pay a fee, if any, established by a resolution of the city at the time the appeal is filed. The city shall review the decision de novo. [Ord. 15-27 § 3.]

The Bethel Municipal Code is current through Ordinance 17-43, and passed September 26, 2017.
Disclaimer: The City Clerk's Office has the official version of the Bethel Municipal Code. Users should contact the City Clerk's Office for ordinances passed subsequent to the ordinance cited above.

ALL NOTICES WERE DONE IN ACCORDANCE WITH

BETHEL MUNICIPAL CODE 16.10.140

CLASSIFIEDS

For Sale

For Sale:
Hitzer Amish built woodstoves. UHMW Plastic sled runners. 543-2379. (11)(3/1-cnx)

FOR SALE
300 Gallon Plastic Water Tanks in stock. Call Shorty at Shorty's Shop for pricing. 543-3158 or 545-3157 (19)(9/18-cnx)

18' SSV Lund with 60 hp high thrust Yamaha 20 inch shaft. About 150 hours on motor, maintained well with no problems. In excellent condition. Lund boat reinforced side and motor mount, no leaks. Minor dents. Asking $11,000. Email me at boy4ever79@yahoo.com. (42)(12/23-cnx)

House for Sale
24x24, freshly remodeled, 1 bedroom. Must be moved. 545-1890. (12)(9/21-cnx)

Steambath for Sale at a reduced price! ~~$8,500~~ $8,000 Contact Shorty 545-3157. (12)(6/21-cnx)

For Sale: Plastic Water Tanks
Only 31" wide, 70" high, 74" long. 500

FOR RENT: 3 BEDROOM, NO PETS, NON-SMOKING, $1250/MONTH; NO UTILITIES INCLUDED. 543-4660 LEAVE MESSAGE. (14)(1/17-cnx)

Real Estate

For Sale 23,500 square foot lot/downtown location on Chief Eddie Hoffman Highway (or State Highway) across from Fire Station. Serious offers only. 907-543-3552. (23)(7/28-cnx)

235 Mission Lake RD
12820 FT all filled and leveled with 2 buildings. One 22 by 34, 1496 sf 3plex. One 30 by 56, 1680 sf 3 plex. 545-0929. (29)(9/21-cnx)

For Sale 630 PTARMIGAN STREET Commercial Lot. $165,000.
630 PTARMIGAN STREET Commercial Lot 15000 SF completely filled. Also a 24 x 56 4plex can be moved to it. 1900 SF building 545-0929. (24)(4/12-cnx)

Employment

CITY OF UNALAKLEET POLICE OFFICER
QUALIFICATIONS:
•19 years of age or older
•High School graduate or GED
•Current valid Alaska Driver's License
•Experience as a Police Officer in Alaska is desirable
•Work experience in rural Alaska desirable
•No prior criminal convictions of misdemeanors or felonies within the past 5 years
STARTING SALARY RANGE: $21.00 per hour, plus benefit package. DOE

• Prepare summary report
To get the full RFP package contact and for more information or questions/inquiries regarding this RFP may be directed to Steven Alexie at salexie@nativecouncil.org or (907)543-2608. (150)(1/24-2/14)

Public Notice

VFW MEMBERSHIP Freedom isn't free, and millions of Americans have paid the price for the freedom we enjoy today. Since 1899, the Veterans of Foreign Wars has served those who served America. From writing veterans legislation and then leading the fight to get it through Congress, to community projects that benefit all Americans, the VFW is an opportunity for veterans to continue to serve. Contact the VFW Robert V. Lindsey Post #10041 at 543-2241 and ask what you can do for your community. (83)(3/26-cnx)

NVP has secured funding from the Bureau of Indian Affairs to begin transportation planning for Paimiut lands. A public meeting was held in September which resulted in a draft Long-Range Transportation Plan. This plan is posted on their website at www.paimiut.org for public review. Please send any comments, questions or concerns to Native Village of Paimiut PO Box 240084, Anchorage, AK 99524, fax at 907-561-9878 or email at paimiut@alaska.net. The comment period will be open until February 15, 2018, and a meeting will be scheduled following the comment period. The public meeting for the draft LRTP will be on February 22, 2018 at the Brown TC Building in Hooper Bay, AK at 4pm. (113)(1/17-1/24; 1/31-2/7)

REQUEST FOR A SPECIAL USE PERMIT PUBLIC HEARING NOTICE
Notice is hereby given that on December 22, 2017, the City of Bethel Planning Office received a request for a public hearing for the placement and construction of a tall tower for the Bethel Wind Project. The coordinates are latitude 60.78029, longitude-161.88598; Section 15, Township 8N, Range 72 West, Seward Meridian. This area is undeveloped land that is west of Old BIA Road, about 0.3 miles southwest of the Bureau of Indian Affairs Administrative Site, and approximately 1.2 miles west of the Bethel Airport.
Land Owner: Bethel Native Corporation, P.O. Box 719, Bethel, AK. 99559. Contact: Ana Hoffman, 1-907-543-2124.
Applicant: Alaska Village Electric Cooperative, 4831 Eagle Street, Anchorage, AK. 99503. Contact: Forest Button, 1-907-561-1818.
Purpose: To construct a wind tower for energy needs.
City of Bethel Contact: Betsy Jumper, Planner, City of Bethel Planning Dept., 543-5603.
Time and Place: The regular scheduled meeting of the City of Bethel Planning Commission, 6:30 PM February 8, 2018 at City Hall, located at 300 Chief Eddie Hoffman Highway in Council Chambers. (177)(1/31-2/7)

GRANT AVIATION

CITY OF BETHEL

Planning Office

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Posted 2-1-2018 at Swanson's, the Post Office and City Hall Bulletin Boards

A SPECIAL USE PERMIT FOR A TALL STRUCTURE HAS BEEN SOUGHT FOR THE BETHEL WIND PROJECT SITE.
A public hearing is scheduled for THURSDAY, FEBRUARY 8, 2018, in compliance with Bethel Municipal Code 16.10 and Ordinance #15-27.
FOR MORE INFORMATION, CONTACT:
Betsy Jumper, Planning Director
City of Bethel Planning Department at
P.O. Box 1388, Bethel, AK 99559,
907-543-5301, or
bjumper@cityofbethel.net