Final Report Nikolski Wind-Diesel Project; Wind Turbine Installation
October 14, 2010

Provided by the Aleutian Pribilof Islands Association
Contract A 48 HECG
Written by Bruce Wright, Senior Scientist

Introduction: In 2005 the Aleutian Pribilof Islands Association (APIA) requested $2,674,680 for installation of high penetration wind diesel hybrid power plants in Sand Point, St. George and Nikolski with a thermal recovery system integrated into existing heating systems within the communities, such as the schools, community buildings and other large buildings that require significant heat in the winter**.** The project title was: HIGH PENETRATION WIND-DIESEL HYBRID POWER IN "THE BIRTHPLACE OF THE WIND": SAND POINT, ST. GEORGE, AND NIKOLSKI, ALASKA**.**

It was clear to APIA and their partners in the project that this wind diesel configuration would produce the greatest potential future savings for the community, the greatest leverage against increasing fuel prices and other liabilities associated with diesel only generation, and flexibility for future electric and thermal load growth within the communities.

The Nikolski specific component of this project was funded by the United States Department of Agriculture Rural Utilities Service Assistance to Rural Communities with Extremely High Energy Costs.

TDX Power completed the design and procured materials, equipment, labor, permits and supervision to construct a fully operational 65 kilowatt Wind Turbine Generator System (WTGS) and associated equipment and interconnect to the newly commissioned diesel fuel based power plant in Nikolski in accordance with the International Electrotechnical Commission (IEC) Wind Turbine Standards. This was accomplished by July 28, 2007. The fully functional turbine could not be connected to the power plant through the installed transmission line due to potentially significant incompatibility with the control panels. Umnak Power, TDX Power, APICDA and Alaska Energy Authority (AEA) worked with the control panel manufacturer on the design and engineering aspects, including financing and development of the new control panels. By August 2010, and after many extra trips to Nikolski, project extensions and additional costs, all construction phases of the project meet substantial completion. In September 2010 AEA accepted that the wind system as "Commissioned", AEA (Kris Noonan) took control of the software and CPI, and TDX Power has an O&M contract with Umnak Power to provide support services as required.

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Project Description: This project was funded the United States Department of Agriculture Rural Utilities Service Assistance to Rural Communities with Extremely High Energy Costs**.** The Grant Agreement was dated August 11, 2006 and was an agreement for receipt of High Energy Cost grant funds under section 19 of the Rural Electrification Act of 1936, as amended (7 U.S.C. 918a), between the United States of America, acting through the Administrator of the Rural Utilities Service (RUS), United States Department of Agriculture (USDA), (Grantor) and the Aleutian Pribilof Islands Association (Grantee) for the purposes of satisfactorily performing the Grant Project as described below.

The Wind Turbine Generator System Engineering, Procurement and Construction Agreement ("Agreement") was entered into on10th day of October 2006 by and among TDX Power Services LLC, an Alaska limited liability company, with its principal offices located at 4300 "B" Street, Suite 402, Anchorage, Alaska 99503 ("Contractor"), the Aleutian Pribilof Islands Association, Inc., an Alaska non-profit corporation, with its principal offices located in Anchorage, Alaska ("APIA" or "Association") and Umnak Power Company, an electric utility organized under the laws of the State of Alaska, with its principal offices located at Nikolski, Alaska ("Umnak"). Association, Umnak and Contractor are sometimes hereinafter referred to collectively as the "Parties" and individually as a "Party." (see **Appendix H: Wind Turbine Generator System Engineering, Procurement, and Construction Agreement**)

TDX Power completed the design and procured materials, equipment, labor, permits and supervision to construct a fully operational 65 kilowatt Wind Turbine Generator System (WTGS) and associated equipment and interconnect to the newly commissioned diesel fuel based power plant in Nikolski in accordance with the International Electrotechnical Commission (IEC) Wind Turbine Standards. This was accomplished by July 28, 2007. The fully functional turbine could not be connected to the power plant through the installed transmission line due to potentially significant incompatibility with the control panels. Umnak Power, TDX Power, APICDA and Alaska Energy Authority (AEA) worked with the control panel manufacturer on the design and engineering aspects, including financing and development of the new control panels. By August 2010, and after many extra trips to Nikolski, project extensions and additional costs, all construction phases of the project meet substantial completion. In September 2010 AEA accepted that the wind system as "Commissioned", AEA (Kris Noonan) took control of the software and CPI, and TDX Power has an O&M contract with Umnak Power to provide support services as required. Aspects of the project and the deliverables are described below.

Wind Feasibility Study: A wind power feasibility study supplements the APIA Grant Application to the Rural Utilities Service to fund wind diesel power projects in three remote Alaskan villages (see **Appendix F: Wind Power Feasibility Study Sand Point, St. George and Nikolski, Alaska**). A critical supplement to this report is a detailed model outlining various options for including wind power as a source of both electricity and heat in the three community power plants. Low, medium and high penetration options are addressed, with equipment options from two utility grade suppliers of wind turbines. In the high penetration model, excess electricity from the wind turbines would be used to create thermal energy and stored for

immediate use for space heating or other beneficial application through a hot water storage and distribution system at the adjacent school.

Avian Study: The principal goals of baseline bird studies are to quantitatively describe the temporal and spatial use by birds of the study area and provide baseline information on avian species and their habitat sufficient to use in evaluating the probable impact of installation of a wind turbine. The specific goals of this work are to provide avian monitoring protocol training to local agent(s), collect avian data to determine bird activity at the delineated areas around the turbine site, record any dead or downed (injured) birds at the site that may be the result of collisions with the meteorological tower, and prepare avian monitoring reports including back-up information and complete avian data. Local resident(s) should to be trained to assist in collecting bird movement data and be provided the study protocols and training. The data collection will consist of two main types of sampling: visual surveys and audiovisual surveys. The emphasis of all sampling will be to quantify the movements of birds at the proposed windfarm location. All surveys will be accompanied by a standardized set of environmental data collected at the beginning of all sampling sessions: wind direction, wind speed, cloud cover, ceiling height, minimal horizontal visibility, light condition and precipitation.

Findings: The US Fish and Wildlife Service (USFWS) was consulted and they are not aware of any bald eagle nests in the area. The survey of local knowledge found that the area has no bald eagle nests (active and inactive), roosts and perches. The local knowledge survey data indicated no birds used the area of the proposed wind turbine site and no dead birds we observed near the met tower. This information was adequate to not require further avian studies and to allow the project to proceed.

Since the turbine has been installed there have been no observations of bird strikes or down or dead birds near the turbine. The USFWS provided protocols for handling dead or injured eiders, a species of concern. See **Appendix C: Protocol for Handling Sick, Injured, and Dead Spectacled and Steller's Eiders**

Foundation: TDX Power completed all the site assessment work necessary prior to installing the wind turbine, including an engineering evaluation and design for the foundation and tower, as appropriate for all site work to be accomplished within the approved budget. Geotechnical analysis of the soil at the site was better than expected. The soft loamy soil is underlain by a gravel base, providing a solid bottom for the foundation. The foundation was constructed over several days in June 2007. The foundation consists of a 20’ x 20’ x 2’ slab 6’ underground; (2) 48” x 5’ culverts filled with rebar and concrete; topped by a 20’ x 20’ x 8” concrete slab. A total of 68 cubic yards of concrete was used in the foundation.

The road to the site was too soft to bear the weight of the materials and required substantial work prior to hauling materials to the site. Due to the continually and rapidly increasing costs for

transportation and supplies, the contingency amount of $8,080.00 proved inadequate to the requirements of the road repair.

The foundation was left to cure for one month prior to erection of the wind turbine.

Wind Turbine: The contractor purchased a 65 kilowatt Vestas V-15 wind turbine that was retrofitted within certain design parameters applicable to installation of a wind turbine in Nikolski, Alaska and shipped to the Nikolski project site. This was accomplished by TDX Power including installation, on July 28, 2007. The blades are new and are appropriate to the environment, coated heavily with a composite to prevent deterioration from the salty sea air. The turbine and tower were put together on site during the last week of July. The custom designed tilt-up design worked exactly as intended, coming down perfectly on the anchored bolts with less than one quarter inch of play.

Local Workforce: The Contractor utilized the local Nikolski workforce whenever possible. Multiple, simultaneous projects in Nikolski overburdened the small local labor force and required additional imported labor.

Guarantees, warranties, spares and maintenance manuals: Nikolski has the Vestas 65kW Wind Turbine Operations Manuals. The Nikolski-specific wind-diesel power plant operations and maintenance manuals were used to complete the training given during the integration with the power plant. TDX Power provided all guarantees and warranties. Spares are available in storage onsite. TDX Power will enhance the manuals over the two year site operations, maintenance, and support period. Due to the highly specialized nature of WTGS and integrated wind-diesel projects, and new technology development additional and continual training may be required and will be provided.

Construction and Integration: TDX Power has completed all construction aspects including all subsystems of the WTGS such as control and protection mechanisms, internal electrical systems, mechanical systems, support structures, foundations, interconnection to the existing Nikolski power plant, and control system compatibility and final calibrations for the control and internal electrical systems. Integration of the WTGS with the existing diesel power plant by TDX Power was completed upon completion of the remanufacturing of the third generator for the diesel power plant. See **APPENDIX B: Nikolski Wind – Diesel Power System Status Report, Aug. 27, 2010**

Safety: TDX Power has completed all construction-related aspects and has provided the

appropriate level of protection against damage from all hazards from these systems during the planned WTGS lifetime and specific requirements for the safety of WTGS, including design, installation, maintenance, and operation under the Nikolski site environmental conditions. Turbine integration to the power plant was completed after control panel compatibility issues were finalized and connection to the power plant control systems was completed. WTGS system safety for operations and maintenance shall occur during the two years of operator supervision and training, with pre-training materials developed in conjunction with the control panel modifications and integration, which is currently occurring.

Commissioning: TDX Power, along with sub-contractor CPI, conducted the commissioning of the wind – diesel power system at Nikolski during the summer of 2010. A first trip provided test data of the main components and identified deficiencies in the control, communications and electrical heating configuration. The second trip addressed and corrected the communications and electrical heating configuration. The control deficiencies were addressed, but could not be completely corrected. Mostly stable operation of all system elements were confirmed over a two week test period. During the test period the wind turbine ran for over 70 hours. The system was left in an automatic run mode.

During the Commissioning tests data was collected via the SCADA package with verification of mostly stable system operation under a variety of wind conditions.

Although the hybrid power system was operational, it exhibited a number of fault conditions, which in some cases caused loss of power to the village. The faults were manually resettable from the powerhouse, but indicate a lower system reliability and robustness than is desirable. The faults are primarily a result of system control and communications delay deficiencies. Improved performance and reliability could be achieved if these deficiencies were addressed. The Nikolski IRA had TDX Power repair the diesel plant in November 2007. The IRA covered the cost themselves, with no funds used from this grant. See **APPENDIX B: Nikolski Wind – Diesel Power System Status Report, Aug. 27, 2010.**

Training: TDX Power has trained local residents to climb the turbine tower safely using proper climbing gear and how to provide maintenance to the turbine. Additional training by the Contractor shall be provided to local utility employees on operations and maintenance of the WTGS. The Contractor will provide ongoing support for a period of two years from date of substantial completion to assist with parts and materials, ongoing training, and annual maintenance, including a minimum of two site visits during the two year period**.** See **Guarantees, warranties, spares and maintenance manuals** and **Safety sections above** and **APPENDIX B: Nikolski Wind – Diesel Power System Status Report, Aug. 27, 2010**

No-Cost Extensions: Several delays in the project from unforeseen circumstances resulted in requests for no-cost extensions (see **Appendix D: No Cost Extension Request**). These were given by USDA. The use of no-cost extensions to extend this project and making all the funds available allowed for a successful project. The USDA should be commended for their flexibility in managing this project.

Quarterly Reports: APIA was responsible for the reporting on a quarterly basis for this project. This allowed for input from USDA and was used to keep all the interested and involved parties informed of the project's progress. An example quarterly report can be seen at **Appendix E. Quarterly Reports, APIA Progress Report on the Nikolski Wind-Diesel Project.**

Grant Conditions and Limitations: In **APPENDIX A: Grant Special Conditions or Limitations** are the specific terms of the grant between USDA/RUS and APIA. The other terms of the grant are standard federal requirements and APIA policy.

Conclusions: This grant did not address or have adequate funding planned for the control panel issue due to the repeated reassurances of the power plant manufacturer, despite concerns from the community and contractor well before power plant design and completion. Additionally, an un-maintained or under-maintained power plant operated outside of the specifications, that does not have total capacity due to the lack of a third genset, cannot provide the reliable backup and seamless exchange required for high penetration wind energy. Since high penetration cannot be achieved due to circumstances outside the contractor's control, a low penetration was installed. Additional and matching funds were provided by APICDA, Alaska Energy Authority, TDX Power and Umnak to cover cost overruns and bring this project to fruition. In the first few months of operation the community is seeing a near 50% decrease in their need for diesel for both running the power plant generators and heating the facilities that use the heat from thermal energy created from excess production from the wind turbine.

We hope the success of this project and the lessons learned will empower Rural Utilities Service (RUS), United States Department of Agriculture (USDA) to continue to support similar projects in Alaska and the nation.

We would like to thank the Alaska Energy Authority, Nikolski IRA Council and TDX Power staffs for all their hard work and dedication to this project. On many occasions they exceeded expectation and made this project a success.

APPENDIX A: Grant Special Conditions or Limitations

The Grantee agrees and accepts all the following Special Conditions or Limitations established for this Grant:

8.1. The Grantee shall carry out the project and construction activities as described in the project application and environmental report, as modified by the revised project implementation plan, schedule, and budget approved by RUS. Any further amendments or revisions, including any change in the designated project manager, must be approved in writing by RUS.

This term has currently been met and shall be for the life of the grant. No amendments or revisions are required at this time.

8.2. The Grantee shall submit a revised final project implementation plan, budget, and schedule for RUS review and approval before any advance of grant funds.

This term has currently been met and shall be for the life of the grant. No amendments or revisions are required at this time.

8.3 The grant term will run for up to three years from date agreement is executed and may be extended with approval of RUS.

This term has currently been met and shall be for the life of the grant. No amendments or revisions are required at this time. To comply with term 8.5, this grant cannot be closed out before the turbine has successfully generated power to the community for one year's time, which cannot occur before the turbine is producing power, estimated to be December 2008.

8.4. This Grant Award does not require any contribution of matching funds, however, the Grantee shall report on the total project costs and the expenditure of any non-federal funds, and any project-related contributions or income in its periodic financial and progress reports.

Reporting of the APICDA and any other additional contributions must be made for the quarterly report for period ending September 30, 2007 and any other quarterly reports thereafter when contributions are applied, to satisfy this term.

8.5. The Grantee shall report on the expenditure of grant funds and other Federal and non-federal project funds in quarterly financial reports and progress reports and participation rates during project construction. The Grantee shall attach Form SF 269A "Financial Status Report (Short Form) to the quarterly reports. Quarterly reports shall be due 30 days from the end of each quarter ending March 31, June 30, September 30, and December 31 of each year. The last quarterly report of each calendar year shall serve as

the project annual report. The quarterly report filed after construction has been completed and all project construction expenditures finalized shall serve as the final quarterly report. A final project report evaluating project performance, and detailing final project expenditures, participation rates, and one full year of operating data including estimated energy produced, fuel savings, and/or cost savings associated with the project shall be filed one year after filing of the last quarterly report. At the request of the Grantee, RUS may extend the period for filing quarterly and annual reports.

This term is on schedule to be satisfied. No amendments or revisions are required at this time. The reporting on the year of data on energy produced and fuel and/or costs saved cannot occur until the power plant is fully operational, the turbine is connected to the power plant, the control issues are addressed, and the turbine successfully produces power for the community throughout a year. The grant ends on September 30, 2010.

8.6. The Grantee shall provide bonding and insurance coverage for the project as described in the grant proposal and consistent with USDA grant regulations at 7 CFR parts 3015, 3016, 3019, or their successors, as applicable.

This term has currently been met and shall be for the life of the grant. No amendments or revisions are required at this time.

8.7. The Grantee shall request advances in writing from RUS using Standard Form 270, "Request for Advance or Reimbursement," and supporting documentation.

This term has currently been met and shall be for the life of the grant. No amendments or revisions are required at this time.

8.8. The Grantee shall provide RUS with a copy of the audit prepared and submitted under the Single Audit Act of 1984 (31 U.S.C. 7051 et seq.) and 7 CFR Part 3052, or its successor, for any year in which Federal funds expended under this grant agreement total $500,000 or more. At the Grantee's option under 7 CFR 3052, it may elect to provide the Agency with a program-specific audit.

This term has currently been met and shall be for the life of the grant. No amendments or revisions are required at this time.

APPENDIX B: Nikolski Wind – Diesel Power System Status Report, Aug. 27, 2010

Nikolski Wind – Diesel Power System
Status Report
Aug. 27, 2010

Prepared by TDX Power

Commissioned

TDX Power, along with sub-contractor CPI, conducted the commissioning of the wind – diesel power system at Nikolski during the summer of 2010. A first trip provided test data of the main components and identified deficiencies in the control, communications and electrical heating configuration. The second trip addressed and corrected the communications and electrical heating configuration. The control deficiencies were addressed, but could not be completely corrected. Mostly stable operation of all system elements were confirmed over a two week test period. During the test period the wind turbine ran for over 70 hours. The system was left in an automatic run mode.

During the Commissioning tests data was collected via the SCADA package as verification of mostly stable system operation under a variety of wind conditions.

Although the hybrid power system was operational, it exhibited a number of fault conditions, which in some cases caused loss of power to the village. The faults were manually resettable from the powerhouse, but indicate a lower system reliability and robustness than is desirable. The faults are primarily a result of system control and communications delay deficiencies. Improved performance and reliability could be achieved when these deficiencies are addressed.

These faults can be traced back to the following issues
- Control System
- Wind Turbine interface link to Control System

TDX has worked for the last year to complete the installation of the wind diesel power system using the major components provided by
wind turbine - Tribe
diesel gensets, controls and powerhouse - AEA / CPI
communication links and resistive heat elements - TDX
three phase distribution to turbine and lodge - TDX

We have commissioned all the components of that system. Remaining concerns are the

responsibility of CPI, which promised to provide a functioning wind-diesel control system. TDX has never had responsibility for these components, the control code or its design and implementation.

Suggested Improvements

Improvements in system performance (efficiency, reliability and robustness) could be obtained by addressing the observed deficiencies listed below:.

Control System

- Power level signals inside the controller have a significant time delay: on the order of 3 to 5 seconds.
- Controller response to vary the electrical heat to balance wind turbine output is too slow.
  - Reverse power flow in powerhouse is worst-case example, which has occurred numerous times.
- Controller code does not provide sufficient system stability in turbulent wind environments.
- Controller allows sympathetic grid frequency oscillations that feed the diesels and the wind turbine.
- Diesel dispatch code (switching from one genset to the other) has suspect set-points and control algorithm for a wind-diesel configuration.

Wind Turbine interface link to Control System.

- Control code cannot automatically command the wind turbine to run or stop, only the wind turbine Web user interface in the powerhouse can do that.
- Control code cannot reset faults registered at the wind turbine.
- Wind turbine has experienced over speed trips while operating. This condition needs to be investigated to determine cause
  - Extreme High power events
  - Sensor fault
  - Interaction or instability with grid frequency

Recommended Actions

Taking action on the above items should correct the current deficiencies which in turn should lead to higher fuel savings and a more reliable, robust system. Testing and long-term performance observations should be compiled for validation and as a guide for continued performance. Maintenance and troubleshooting will be accomplished under a 5 year contract between Nikolski IRA Council and TDX Power.

APPENDIX C: Protocol for Handling Sick, Injured, and Dead Spectacled and Steller's Eiders

Protocol for Handling
Sick, Injured, and Dead Spectacled and Steller's Eiders

Reporting
All distressed, disabled, and dead spectacled and Steller's eiders found should be reported as soon as possible. Attempt to contact the following people in the order listed until you succeed in reaching someone (numbers are listed below in the *Contacts* section): Greg Balogh, Charla Sterne, Kim Trust, Ted Swem, Dan Mulcahy, Dave Dorsey, Cindy Palmatier, Robert Suydam Dr. Derrick Leedy, Fred Broerman.

Illegally Killed Birds
If you find eiders that appear to have been killed illegally, contact a Service Law Enforcement office immediately (see *Contacts* section). When possible, notification should occur before the dead birds are removed from the site.

Notification should include:
1. Species, number of birds, date, time and location found;
2. Suspected cause of death;
3. Circumstances under which found;
4. If known, the names of witnesses or suspects, and a description of any vehicles or boats involved (non-law enforcement individuals are not expected to conduct investigations to obtain information that is not readily available).

If a camera is available, photograph birds and other evidence such as shotgun shells or casings, and persons and vehicles involved. Note photo date, time, and location.

Note: If you observe an eider being killed illegally and recover the dead bird, please refer to "Note" section under shipping instructions.

Handling Injured or Sick Birds
For apparently minor injuries (e.g. small lacerations, web tears, minor stunning), you should release the bird on site if: (1) you are so advised; or (2) you are out of radio/phone contact and the bird meets ALL OF THE FOLLOWING CRITERIA.

<u>Criteria for determining whether bird should be released:</u>
1. Bird can stand and walk using both feet.
2. Bird can flap both wings and there is no apparent wing droop.
3. Bird is alert, active, holds its head up and reacts to stimuli.
4. Bird is not bleeding freely.

5. Wing and tail feathers have not been lost and are in good condition.
6. Bird is waterproof (water beads up on feathers).

Retain birds that do not meet ALL of the above criteria, provide preliminary and secondary field care and report the bird (see *Reporting* section)

Preliminary Field Care:
1. Transport the bird to camp in a manner that is least likely to further injure or stress it.
2. Minimize bird handling (wear rubber gloves to prevent loss of feather waterproofing).
3. Keep birds in a quiet place.

Secondary Field Care:
1. Attempt to contact one of the following people in the order listed: Greg Balogh, Charla Sterne, Kim Trust, Ted Swem, Angela Matz, Dan Mulcahey, Dave Dorsey, Cindy Palmatier, Robert Suydam Dr. Derrick Leedy, Fred Broerman. They will help determine whether the bird should be shipped to Anchorage, will arrange for shipping and subsequent care of the bird, and will arrange for pick-up in Anchorage.
2. Note recovery location, time, persons involved, and reason bird was recovered.
3. Keep bird in a cage or box with adequate ventilation and access to cool or cold fresh water. Overheating is a common problem with captive eiders. If bird is dry, be careful not to place bird in overly warm environment. Wet birds should be placed in a warm (not hot) place to dry off. If possible, place absorbent materials or a frame covered with fine mesh Dacron netting in the bottom of the container to minimize contact between bird and feces.
4. Food may be offered if bird is alert. Try moistened cat or dog food, boiled egg, or seafood.
5. Record when bird eats and drinks.
6. Minimize handling of the bird. Wear rubber gloves to prevent loss of feather waterproofing.

Sacrificing Birds

If the bird is seriously injured, sick or suffering (and appears to be dying) and you cannot reach the listed contacts, you may euthanize it. An endangered species permit and this protocol authorize this activity. If appropriate, and if you know how, you may take samples before and after sacrificing the bird (contact AFWFO regarding which samples are needed). Otherwise, continue treating the bird as directed above or as advised by a D.V.M. until shipment to Anchorage can be arranged (see *Shipping Birds* section). Birds suffering from toxicity (e.g., lead poisoning), gunshot wounds, head injuries, or broken bones should be shipped live to Anchorage as soon as possible (unless circumstances warrant euthanasia). Field biologists who anticipate that they may need to sacrifice birds should receive training prior to their field season. Contact AFWFO or Dr. Dan Mulcahy to arrange for training. In locations near veterinary facilities, birds

that warrant euthanasia may be transported to a veterinary office where the procedure can be administered professionally. [1]

Field Procedures for Sacrificing Birds

If you are trained and equipped, obtain blood samples before euthanizing the bird. Administer euthanasia away from the general public. The preferred field methods for euthanizing birds are cervical dislocation (breaking the neck) and decapitation.

Cervical Dislocation

Place the head, bottom of the bill down, on a flat, solid surface. Place a solid rod (stick, dowel, etc.) on the neck directly behind the head. Holding the rod firmly on the neck, seize the body in the other hand, and give a quick, definite, and strong yank backwards, without letting the head move. You should feel the neck stretch and break. A slow or tentative pull will not work. It may help to pull the bird's body up as well as backward. The bird may shudder or tremble for a minute. Repeat the procedure if necessary.

Decapitation

Use a large, heavy blade or ax. Cut through the neck in one stroke. This procedure is quick and minimizes suffering. However, it is messy and carries risk of injury to yourself.

Shipping Live Birds

Reporting

Attempt to contact one of the following people in the order listed: Greg Balogh, Charla Sterne, Kim Trust, Ted Swem, Angela Matz, Dan Mulcahey, Dave Dorsey, Cindy Palmatier. They will help determine whether the bird should be shipped to Anchorage, will arrange for shipping and subsequent care of the bird, and will arrange for pick-up in Anchorage.

Preparation

Stabilize and rehydrate birds (offer cool or cold water in a stable bowl) before shipping.

Shipping

Ship birds in a cat or small dog carrier. Place absorbent cardboard or shredded paper in the bottom (if you can fit a wooden frame to the bottom of the carrier and affix fine-mesh Dacron netting to it; that is even better). Do not ship with food or water. Block the front grate of the carrier with tape or cardboard to minimize stress to the bird (but ensure adequate ventilation). Tape the bird's records to the container. If you want the container back, include name and address for return. Clearly label the container with: LIVE BIRDS, U.S. Fish and Wildlife Service, Anchorage, AK. (907) 271-2778.

[1] Note that, in all likelihood, a village veterinarian will not be covered under an endangered species permit. His or her assistance would, technically, be in violation of the ESA. Presumably, in situations where the vet was acting as a good Samaritan for a permittee, we would exercise discretionary enforcement.

Expenses
Some airlines will carry the birds for free, often in the crew's compartment. They do this as a favor and should be approached with courtesy. If the bird is being sent to the Bird TLC, it may be helpful to use their name in the conversation. Also mention the threatened species status where appropriate. If payment is necessary, AFWFO or FFWFO will cover shipping expenses.

Shipping Dead Birds

Note: Law Enforcement Concern - If the bird died as a result of an illegal act, such as shooting, and the illegal act was directly observed by the individual collecting the dead bird, a law enforcement office should be contacted for shipping instructions. Desired samples can be taken prior to shipping the bird to a law enforcement office. However, in order to properly pursue any related investigation, it will be necessary for law enforcement to take custody of the dead bird/s as soon as possible.

Storage
Obtain desired samples as soon as possible (e.g., blood or tissues for approved recovery task). Keep the carcass refrigerated if the bird will be sent within 48 hours for necropsy or additional samples. Only freeze birds after samples are taken or if shipping delays are inevitable. When in doubt, refrigerate until you talk to appropriate person(s). In remote field camps, place carcass in a pit dug down to permafrost.

Packaging and Shipping
Wrap chilled carcass in absorbent material, if possible, and place in large ziplock or other waterproof plastic bag. Include a tag with complete information about the bird, its death and collection, and your name, address and phone number. Ship in an insulated container. Pack with frozen gel packs if available. Do not ship with wet ice. If it is obvious to you that the carcass will spoil during shipping, contact AFWFO or FFWFO prior to shipping for further instructions. Notify receiving person(s) of flight arrival time so the package will not sit at the airport. Avoid shipping to government offices on Thursdays or Fridays (There is no mail delivery there on Saturdays and Sundays).

Expenses
If needed, AFWFO/FFWFO will arrange for shipping and expenses.

Taking Samples
Sample needs change with time. Contact AFWFO/FFWFO for current sample needs and procedures.

Contacts

Greg Balogh AFWFO, Anchorage	(800) 272-4174 toll free (907) 271-2778 work (907) 345-9899 home
Charla Sterne, AFWFO, Anchorage	(907) 271-2781 work
Ted Swem FFWFO, Fairbanks	(907) 456-0441 work
Kim Trust, AFWFO, Anchorage	(907) 271-2783 work (907) 276-0005 home
Angela Matz, FFWFO, Fairbanks	(907) 456-0442 work
Dan Mulcahy, D.V.M., National Biological Service	(907) 786-3451 work (907) 694-2514 home
Dave Dorsey, Bird TLC volunteer	(907) 351-4968 cell
Cindy Palmatier, Bird TLC director	(907) 522-4573 home
Bird TLC/Arctic Animal Hospital	(907) 562-4852 clinic
Pet Emergency Treatment, Inc.	(907) 274-5636
Robert Suydam, N.S. Borough, Barrow	(907) 852-0350
Dr. Derrick Leedy, DVM, Nome	(907) 443-2800
Fred Broerman, Yukon Delta NWR, Bethel	(907) 543-3151
Law Enforcement, FWS, Fairbanks	(907) 456-0255 (877)-535-1795 toll-free (907)-456-0459
Law Enforcement, FWS, Nome	(907) 443-2479 (907) 443-2938 fax
Law Enforcement, FWS, Regional Office	(907) 786-3311 (907) 786-3313 fax
Law Enforcement, FWS, Anchorage	(907) 271-2828 (800) 858-7621 toll-free (907) 271-2827 fax

APPENDIX D: No Cost Extension Request
APPENDIX E. Quarterly Reports

APIA Progress Report on the Nikolski Wind-Diesel Project
Phase 1 Wind Turbine Installation
September 12, 2007

This report, written in Times New Roman 12 pt. font, cites the two documents below shown in Bold Arial 11 pt. font, and refers to the 'Section 8 Terms of the Grant' between USDA/RUS and APIA and the 'Scope of Work' between APIA and TDX Power:

United States Department of Agriculture
Rural Utilities Service
Assistance to Rural Communities with Extremely High Energy Costs
Grant Agreement

1. THIS GRANT AGREEMENT (Agreement) dated August 11, 2006 is an agreement for receipt of High Energy Cost grant funds under section 19 of the Rural Electrification Act of 1936, as amended (7 U.S.C. 918a), between the United States of America, acting through the Administrator of the Rural Utilities Service (RUS), United States Department of Agriculture (USDA), (Grantor) and the Aleutian Pribilof Islands Association (Grantee) for the purposes of satisfactorily performing the Grant Project as described below.

Wind Turbine Generator System Engineering, Procurement, and Construction Agreement

This Wind Turbine Generator System Engineering, Procurement and Construction Agreement ("Agreement") is entered into this 10th day of October 2006 by and among TDX Power Services LLC, an Alaska limited liability company, with its principal offices located at 4300 "B" Street, Suite 402, Anchorage, Alaska 99503 ("Contractor"), the Aleutian Pribilof Islands Association, Inc., an Alaska non-profit corporation, with its principal offices located at 201 East 3rd Avenue, Anchorage, Alaska ("APIA" or "Association") and Umnak Power Company, an electric utility organized under the laws of the State of Alaska, with its principal offices located at Nikolski, Alaska ("Umnak"). Association, Umnak and Contractor are sometimes hereinafter referred to collectively as the "Parties" and individually as a "Party."

The following are the specific terms of the grant between USDA/RUS and APIA. The other terms of the grant are standard federal requirements and APIA policy.

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8. The Grantee agrees and accepts all the following Special Conditions or Limitations established for this Grant:

8.1. The Grantee shall carry out the project and construction activities as described in the project application and environmental report, as modified by the revised project implementation plan, schedule, and budget approved by RUS. Any further amendments or revisions, including any change in the designated project manager, must be approved in writing by RUS.

This term has currently been met and shall be for the life of the grant. No amendments or revisions are required at this time.

8.2. The Grantee shall submit a revised final project implementation plan, budget, and schedule for RUS review and approval before any advance of grant funds.

This term has currently been met and shall be for the life of the grant. No amendments or revisions are required at this time.

8.3 The grant term will run for up to three years from date agreement is executed and may be extended with approval of RUS.

This term has currently been met and shall be for the life of the grant. No amendments or revisions are required at this time. To comply with term 8.5, this grant cannot be closed out before the turbine has successfully generated power to the community for one year's time, which will not occur before September 30, 2008.

8.4. This Grant Award does not require any contribution of matching funds, however, the Grantee shall report on the total project costs and the expenditure of any non-federal funds, and any project-related contributions or income in its periodic financial and progress reports.

Reporting of the APICDA and any other additional contributions must be made for the quarterly report for period ending September 30, 2007, and any other quarterly reports thereafter when contributions are applied, to satisfy this term. (SEE Attachment A: Budget Estimate for APICDA Assistance)

8.5. The Grantee shall report on the expenditure of grant funds and other Federal and non-federal project funds in quarterly financial reports and progress reports and participation rates during project construction. The Grantee shall attach Form SF 269A "Financial Status Report (Short Form) to the quarterly reports. Quarterly reports shall be due 30 days from the end of each quarter ending March 31, June 30, September 30, and December 31 of each year. The last quarterly report of each calendar year shall serve as the project annual report. The quarterly report filed after construction has been completed and all project construction expenditures finalized

shall serve as the final quarterly report. A final project report evaluating project performance, and detailing final project expenditures, participation rates, and one full year of operating data including estimated energy produced, fuel savings, and/or cost savings associated with the project shall be filed one year after filing of the last quarterly report. At the request of the Grantee, RUS may extend the period for filing quarterly and annual reports.

This term is on schedule to be satisfied. No amendments or revisions are required at this time. The reporting on the year of data on energy produced and fuel and/or costs saved cannot occur until the power plant is fully operational, the turbine is connected to the power plant, the control issues are addressed, and the turbine successfully produces power for the community throughout a year.

8.6. The Grantee shall provide bonding and insurance coverage for the project as described in the grant proposal and consistent with USDA grant regulations at 7 CFR parts 3015, 3016, 3019, or their successors, as applicable.

This term has currently been met and shall be for the life of the grant. No amendments or revisions are required at this time.

8.7. The Grantee shall request advances in writing from RUS using Standard Form 270, "Request for Advance or Reimbursement," and supporting documentation.

This term has currently been met and shall be for the life of the grant. No amendments or revisions are required at this time.

8.8. The Grantee shall provide RUS with a copy of the audit prepared and submitted under the Single Audit Act of 1984 (31 U.S.C. 7051 et seq.) and 7 CFR Part 3052, or its successor, for any year in which Federal funds expended under this grant agreement total $500,000 or more. At the Grantee's option under 7 CFR 3052, it may elect to provide the Agency with a program-specific audit.

This term has currently been met and shall be for the life of the grant. No amendments or revisions are required at this time.

The following are the specific scope of work items of the contract between APIA and TDX Power. The other terms of the contract are standard federal requirements, customary business indemnifications and provisions, and APIA policy.

Exhibit A: Scope of Work

The Contractor shall procure or furnish the design, materials, equipment, labor, permits

and supervision to construct one fully operational 65 kilowatt Wind Turbine Generator System (WTGS) and associated equipment and interconnect to the newly commissioned diesel fuel based power plant in Nikolski in accordance with the International Electrotechnical Commission (IEC) Wind Turbine Standards.

TDX Power completed the above construction aspects by July 28, 2007, with two exceptions. The step-down transformer from the transmission line to the power plant was delivered inoperable and is being replaced under warranty. It will be installed as soon as it can be attained and transported to Nikolski; anticipated installation is late October, 2007. The fully functional turbine cannot be connected to the power plant through the installed transmission line because the plant is functionally inoperable in terms of control panel integration with only one working generator.

The Work shall include all subsystems of WTGS such as control and protection mechanisms, internal electrical systems, mechanical systems, support structures, foundations, and interconnection to the existing Nikolski power plant.

TDX Power has completed all construction aspects of this term with the following exceptions: control system compatibility and final calibrations for the control and internal electrical systems cannot be performed until the power plant is functionally operational.

A trench was dug from the wind turbine to the diesel plant and a 15 kV line was buried. The original route surveyed for this line had to be redirected when Arnold Dushkin, IRA Council President, noticed it passed too closely to two graves outside of the cemetery fence. While digging the trench near the diesel plant, liquid diesel fuel oozed out of the soil. There is a significant leak in the line from the day tank into the diesel plant.

This leak was reported to the Alaska Energy Authority by Umnak Power. An AEA technician returned and replaced the newly welded pipe joint, but the leak did not stop. Umnak Power notified AEA, who attested they fixed the leak. It is leaking inside the wall of the power plant and requires immediate attention. The Coast Guard will be notified.

Contractor shall ensure specific requirements for the safety of WTGS, including design, installation, maintenance, and operation under the Nikolski site environmental conditions. Its purpose is to provide the appropriate level of protection against damage from all hazards from these systems during the planned WTGS lifetime.

TDX Power has completed all construction-related aspects of this term. Turbine integration to the power plant shall be completed after generator repair and connection to the power plant control systems. WTGS system safety for operations and maintenance shall occur during the two years of operator supervision and training.

The Nikolski IRA has contracted with TDX Power to do the necessary repairs to their diesel plant that will allow interconnection with the wind turbine. The IRA will cover the cost themselves, with no funds used from this grant. The repairs are scheduled to begin at the end of

October.

The Contractor shall purchase a 65 kilowatt Vestas V-15 Wind Turbine (or approved equal) that has been retrofitted within certain design parameters applicable to installation of a wind turbine in Nikolski, Alaska and ship the Turbine and associated equipment to the Nikolski project site.

TDX Power completed this term, including installation, on July 28 2007.

The Vestas V-15 Wind Turbine was purchased in September from a farmer in Germany who was installing a larger wind turbine in its place. There are no new Vestas wind turbines in this size range available, except in India where they are manufactured for local use only.

The turbine was shipped from Germany to Halus Co. in San Francisco, CA for refurbishing. The design was altered to include a mechanism that automatically untwists the electric cables which run from the nacelle at the top to the turbine base. This will prevent stress on the cables from multiple changes in wind direction, as can happen in Nikolski.

The blades are new and are appropriate to the environment, coated heavily with a composite to prevent deterioration from the salty sea air.

The tower designed by Halus Co. and TDX Power was put together and tested in San Francisco prior to being disassembled and shipped to Nikolski.

The turbine and tower were put together on site during the last week of July. Early on July 28th erection of the turbine began. The wind was exceptionally cooperative with calm weather lasting the entire 12 hours it took to raise the tower. This alone is a miracle. The tilt-up design worked exactly as intended, coming down perfectly on the anchored bolts with less than one quarter inch of play.

The Contractor shall complete all site assessment work necessary prior to installing the wind turbine, including an engineering evaluation and design for the foundation and tower, as appropriate for all site work to be accomplished within the approved budget. The Parties acknowledge that the soil conditions may differ materially from what is expected. Accordingly the budget provides for a contingency amount ($8,080). The Parties agree that this contingency shall not be expended for any purpose other than differing site conditions until the completion of site excavation and final foundation design. After this time, such funds may be expended for discretionary changes to the Project.

TDX Power has completed this term.

Geotechnical analysis of the soil at the site was better than expected. The soft loamy soil is underlain by a gravel base, providing a solid bottom for the foundation. The foundation was constructed over several days in June, 2007. The foundation consists of a 20’ x 20’ x 2’ slab 6’

underground; (2) 48" x 5' culverts filled with rebar and concrete; topped by a 20' x 20' x 8" concrete slab. A total of 68 cubic yards of concrete was used in the foundation.

The road to the site was too soft to bear the weight of the materials and required substantial work prior to hauling materials to the site.

The foundation was left to cure for one month prior to erection of the wind turbine.

Due to the continually and rapidly increasing costs for transportation and supplies, the contingency amount of $8,080.00 shall be designated for discretionary expenditure on the scheduled site maintenance and support.

The Contractor shall utilize the local Nikolski workforce whenever possible.

TDX Power has completed this term whenever possible. Multiple, simultaneous projects in Nikolski overburdened the small local labor force and required additional imported labor.

The Contractor shall provide an evaluation and written report on the integration of the WTGS with the existing diesel power plant, recommending modifications, if any, of the diesel controls and system operability where necessary.

This task will be completed upon repair of the diesel power plant and is not construction related. As noted at the bottom on page 2 of the contract, TDX Power will use reasonable efforts to complete the feasibility report of integrating the turbine to the power plant by December 31, 2007, however until the power plant is operational, it is unreasonable to anticipate that this will be accomplished by this date.

The Contractor shall procure or furnish to Umnak all guarantees, warranties, spares and maintenance manuals that are called for in the specifications or that are normally provided by a manufacturer. The maintenance manual shall include a catalog and price list of any equipment, materials, supplies, or parts used in inspection, calibration, maintenance, or repair of the equipment.

APIA and Nikolski have the Vestas 65kW Wind Turbine Operations Manuals. The Nikolski-specific wind-diesel power plant operations and maintenance manual cannot be written until the turbine has been successfully integrated into an operable power plant. TDX Power will provide all guarantees, warranties, and spares when TDX completes the training in Nikolski after integration of the turbine to an operable power plant. TDX Power will enhance the manuals over the two year site operations, maintenance, and support period. Due to: the highly specialized nature of WTGS and integrated wind-diesel projects; continually and rapidly increasing costs for materials, transportation, and freight; and new technology development; suppliers and costs cannot remain up to date.

Upon completion of the installation, the Contractor shall provide training to local utility employees on operations and maintenance of the WTGS. The Contractor shall provide ongoing support for a period of two years from date of Substantial Completion to assist

with parts and materials, ongoing training, and annual maintenance, including a minimum of two site visits during the two year period.

A trip to Nikolski, planned for September 24-27, for the purpose of a second tightening of bolts on the tower and a tower climbing safety class, was attempted. In addition, training was to be provided for basic diesel plant O & M to alternate plant operators in the community. The diesel plant training was to be paid for with funds from BIA. Due to bad weather the crew was delayed in Dutch Harbor for 3 days waiting to get into Nikolski. The engineer was able to get out to Nikolski for one hour on the 27th. Time constraints prevented him from staying longer. He was able to diagnose the problems with the diesel plant and propose a plan of action to the IRA. The repairs are scheduled to be completed during the last week of October.

TDX Power cannot complete any other turbine or integration training until the power plant is operational. As noted above, the contingency amount ($8,080.00) must be designated for the two years of operations, maintenance, and support to accomplish the site visits and supplies needed.

Steps for Project Completion

1) Immediate concerns for continued power production from remaining generator #1

- Umnak Power needs a fuel delivery.
- The fuel leak from the day tank into the diesel plant must be repaired.
- The line from the tank farm to the diesel plant needs to be pressure tested. The oil saturated soil found when digging in front of the diesel plant is likely from a leak in the line, not from the leak in the wall of the diesel plant.
- The spill needs to be addressed, both inside and outside of the plant.
- The one functional diesel generator needs a major tune-up.
- The engine water pump and alternator belts need to be replaced with correct belts.
- Umnak Power must order additional generator oil and filters.
- Rubber radiator hoses must be replaced.
- The exhaust wall penetration needs repaired to prevent further water intrusion.
- Corroded cannon plug to wireless antennae needs to be replaced.
- Proper flashing needs to be installed on main door to power plant to prevent water intrusion during storms.
- A heat recovery system should be installed or the ventilation system needs to be repaired to prevent excessive heat in power plant.
- Hand operator switch must operate consistently to prevent main breaker use.
- Power plant operations and maintenance needs to be logged daily.
- Operations and Maintenance Protocol must be accomplished.

2) Umnak Power must replace two diesel generators in the existing power plant. The size of the new generators will be determined following a new current and anticipated load analysis. It is likely the largest generator will be increased to 120 kW. The current configuration of the diesel plant is inadequate for the growth of the community and increased activity at the APICDA lodge. Primary Party: Umnak Power. Estimated Costs: $100,000.00.

3) Power plant tool box needs full suite of appropriate tools.

4) Umnak Power, owner of diesel plant and wind turbine, needs an agreement that assigns TDX Power as Primary Operator of the wind-diesel power plant.

5) TDX Power will test existing controls for compatibility of high penetration wind energy.

APPENDIX F: Wind Power Feasibility Study Sand Point, St. George and Nikolski, Alaska

Executive Summary:
This report supplements the APIA Grant Application to the Rural Utilities Service to fund wind diesel power projects in three remote Alaskan villages. A critical supplement to this report is a detailed model outlining various options for including wind power as a source of both electricity and heat in the three community power plants. Low, medium and high penetration options are addressed, with equipment options from two utility grade suppliers of wind turbines. In the high penetration model, excess electricity from the wind turbines would be used to create thermal energy and stored for immediate use for space heating or other beneficial application through a hot water storage and distribution system at the adjacent school.

Recommendations:
TDX Power recommends installation of a high penetration wind diesel hybrid plant in Sand Point, St. George and Nikolski with a thermal recovery system integrated into existing heating systems within the communities, such as the schools, community buildings and other large buildings that require significant heat in the winter. While we acknowledge different perspectives on the economic analysis of such a project, it is clear to us this wind diesel configuration would produce the greatest potential future savings for the community, the greatest leverage against increasing fuel prices and other liabilities associated with diesel only generation, and flexibility for future electric and thermal load growth within the communities.

Some specific components of this recommendation include:

- In St. George, we recommend installation of Three Northwind 100 wind turbines. These wind turbines will tie directly into a new diesel powerhouse module with state of the art switchgears and controls, allowing the wind turbines to actually follow load with no diesel generation during high wind periods.

- In Nikolski, we recommend installation of a Fuhrlaender FL30 wind turbine. This turbine will work directly with a newly installed diesel power house module and will also provide both electricity and heat from thermal energy created from excess production from the wind turbine.

- In Sand Point, we recommend installation of a Fuhrlaender FL1000 wind turbine. This turbine will tie directly into the existing powerhouse through recently installed switchgear and controls specifically designed to accept wind power generation into the grid. Sand Point is the largest of the three communities and as a result the proposed wind diesel generation facility will produce the greatest amount of thermal energy. The system design being proposed will allow all diesel engines to turn off during high wind periods, with the wind turbines actually following load, and excess wind energy will provide thermal energy to the community school and health clinic.

- Completion of a detailed geotechnical analysis is required to confirm the technical feasibility and construction cost estimates for this project. This geotechnical analysis will be the first task completed in each community.

- Negotiation of firm support agreements from both Northern Power and Fuhrlaender have been discussed, including clearly defined warranty and turbine support parameters and costs for the first three years. These agreements should be finalized prior to equipment purchase.

- TDX Power recommends that APIA allow two summer construction seasons to complete installation of all systems in all three communities.

- TDX Power is pleased to serve as an EPC contractor for these projects and will provide appropriate guarantees for project milestones, timelines and budget.

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Installation Cost, Operational Economics & Maintenance Considerations for a Wind Power System Addition for the communities of Nikolski, Sand Point, and St. George, Alaska

Background

The Aleutian Pribilof Island Association (APIA) is interested in adding wind power generation to three of the communities it represent in rural, Alaska. In preparation for submission of a grant proposal to the Rural Utilities Services, APIA asked TDX Power to evaluate the cost and operating economics of integrating a wind energy generation component into the existing diesel power plants. APIA is aware that this type of wind/diesel hybrid integration now has considerable case history experience in Alaska and throughout the world. Properly located and designed, hybrid technology has successfully demonstrated the ability to significantly reduce fuel use and powerhouse maintenance through reduced engine run time. In order to evaluate the cost-benefit of wind integration in the diesel plants in these three communities, APIA also commissioned TDX Power to provide a detailed analysis of the expense and effect of adding wind generation to the planned generating facilities.

TDX Power is an Anchorage based engineering services and generation equipment provider and is the owner/operator of two regulated Alaska electric utilities, located in Sand Point and Prudhoe Bay. TDX also designed and constructed the largest high penetration, cogenerating wind/diesel system in Alaska, located on Saint Paul Island. The 500 Kilowatt Saint Paul hybrid plant has been awarded a variety of DOE innovation and advanced efficiency awards and has been successfully operational since 1999.

This report consists of five sections: 1) recommended hybrid system design, 2) projected installed cost of a wind generation system and its ancillary components, 3) projected impact of the wind generation system on the diesel plant's operating economics, 4) operations and maintenance program considerations and cost, and 5) Schedule and final observations.

Summary Wind/Diesel System Design

The decision path for high, medium, or low penetration includes analysis of the wind resource, the forecasted electric load and analysis of potential uses for thermal energy. The supplemental economic model, which incorporates results from multiple turbine manufacturers and configurations suggests a high penetration design provides superior cost/benefit performance compared to low or medium penetration configurations in all three communities and therefore focused its primary attention on it.

Based on the model, TDX Power recommends a high penetration wind diesel plant with coincident thermal energy generation design for the three generating facilities. The fact that all three communities possess Class 7 rated wind resource provides the primary basis for this recommendation. In such a design, total wind generating capacity exceeds the community peak power demand by between 30% and 70%. Through such capacity and configuration, the engine generators will literally be shut off during periods of relatively high wind speed, defined as above 16 miles per hour. Additionally and importantly, during high wind periods the high penetration design will produce excess electric energy which is converted to thermal energy and stored for use as space heating or other beneficial application through a hot water storage and distribution system.

In a low penetration design, the diesel units must continue to run regardless of wind speed. The wind generators run in constant parallel with the diesel units, which only serves to reduce load on the diesel generators. Such a configuration produces no cogenerated by-product, such as hot water. And in medium penetration design, there is minimal production of a cogenerated by product and relatively little wind-only mode operations, which struggles to justify its investment. By sizing sufficient wind turbine generating capacity to have "wind only" generation periods, as well as the simultaneous production of a beneficial thermal product, the high penetration design produces far greater total fuel avoidance, lower engine maintenance expense, and superior long term total system operating efficiencies compared to the low or medium penetration system. Accordingly, TDX focused its analysis on the high penetration example.

As proven in the Saint Paul Island example, and dozens of similar high penetration wind/diesel installations around the world, the high penetration design functions with utility grade reliability and efficiency when properly designed, deployed and maintained. Such a system is relatively simple, using standard components. The primary building blocks of a high penetration system include the wind generation equipment, microprocessor based sensors that simultaneously monitor instantaneous load and wind speed, specialized switchgear that allow the diesels and

wind turbines to function together either in parallel or singly, and a hot water storage tank with associated thermal energy delivery infrastructure.

A properly developed high penetration facility operates in diesel mode during periods of no wind, in wind-diesel parallel during moderate wind speed periods, and in full diesel-off, wind-only mode during wind periods of approximately 16 mph or higher. In a typical configuration, the electronic signal to commence wind-only mode occurs when the wind energy system is capable of producing approximately 120% of operating demand or a fixed incremental of output above the community load, for at least one hour. During these higher wind periods, the engine generator shuts off automatically and wind turbines follow community load and, in addition, supply excess energy to the water storage tank. In lower wind periods, the diesel generators supply intermittent charge to the water tank to maintain minimum temperature, typically set between 150 and 190 degrees Fahrenheit. The heated water can then be pumped through a piping and radiator network to supply space heating, or used in other beneficial community use application such as swimming pools or commercial activity. The excess-to-load wind energy offsets or eliminates heating fuel requirements.

The installation and operational cost analysis provided in this report is based on the integration of three Northwind 100 wind generators into the planned St. George diesel plant, the Fuhrlaender FL 1000 wind turbine in Sand point, and the Fuhrlaender FL 30 turbine in Nikolski. All three turbines are utility grade and will be fully supported by the respective manufacturers.

Wind System Installation Cost
St. George
TDX Power estimates a total cost of $1,066,000 to fully construct and integrate a three unit, Northwind 100 wind generation facility, with an associated thermal storage and delivery system. This system will tie into a new diesel power house module that will be installed at the same time, to meet the 225 kw average electric load in the community. Funding for the diesel powerhouse has been secured from a separate source and is not part of the grant application to RUS. Following is an itemized breakdown of the major components included in the cost projection:

1. 3 Northwind 100 wind turbines = $765,000
2. Site construction = $260,000
3. Thermal storage and distribution infrastructure = $21,000
4. System components shipment from Seattle = $20,000

The cost analysis assumes three Northwind 100 machines, which would be supplied FOB the Port of Seattle and complete with all necessary subsystems including towers and controllers. TDX Power believes that the wind energy component of the new diesel power plant system must have at least 250 kilowatts of total gross capacity in order to achieve optimum wind-only mode, high penetration design results. As any less than three Northwind generators do not meet the capacity criteria, three are suggested and modeled.

The site construction estimate was supplied by Jim Saint George, an experienced civil contractor in western laska with experience installing wind turbines, and includes turbine foundations. The construction estimate was based on certain assumptions such as piling design foundations, and assumptions of probable soil and subsurface aquifer conditions. While the cost estimate seems reasonable under the circumstances, TDX cautions that geotechnical work has not been completed at the probable St. George location and subject to these further investigations, the construction cost estimate could change.

TDX Power understands the diesel power house module will have Kohler paralleling switchgear in a five section line up. This equipment contains circuit breakers and PLC based controls, a master control section and a section for feeder control. The Kohler system is controlled from a local touch screen and capable of remote operation via a standard WEB browser. The operator interface uses the Advantech touch screen for alarm display, alarm and status logging (500 events), user selectable remote alarms, digital synchronizer, digital real (KW) and reactive (KVAR) load sharing, system information and data display, manual synchronizing and operator control. The engine generator control cells, master section and sectionalizing cells are bussed together. The main buss is rated at 2,000 amps at a typical buss voltage of 480, 3-phase, 4-wire. The Kohler system has the ability to control and monitor a variety of diesel/generator equipment and provide operating personnel with the ability to operate in a total manual mode in the event of PC or PLC failure.

The thermal storage and hot water delivery system price is based on the assumption and recommendation of 8,000 gallons of storage capacity, to be located near or adjacent to the St. George school boiler house. The cost estimate includes the insulated storage tank and all necessary piping and pumps to circulate water at an average temperature of 170 degrees F. The hot water in the storage tank will replace or considerably offset fuel oil use for the school's thermal requirements.

A power plant site plan has been developed with three turbines sited around the power plant. The siting of the wind turbines is somewhat subjective at this point, pending a geotechnical evaluation. However, a rough estimate of where the wind turbines could be placed was prepared to provide a general idea of distances. Both Northern Power and Fuhrlaender wind turbines should have the minimum 2 1/2 - 3 rotor diameters between them, and no less than 10 diameters downwind. Based on data produced from a year's wind resource data from an on site annomometer, we have assumed the prevailing winds are westerly, south westerly.

Nikolski

TDX Power estimates a total cost of $241,000 to fully construct and integrate a single unit, Fuhrlaender FL30 wind generation facility, with an associated thermal storage and delivery system. This system will tie into a diesel power house module that was recently installed by the Alaska Energy Authority to support the average 25 kw electric load for the community. Following is an itemized breakdown of the major components included in the cost projection:

1. 1 Fuhrlaender FL30 wind turbine= $145,000
2. Site construction = $65,000
3. Thermal storage and distribution infrastructure = $11,000
4. System components shipment from Seattle = $20,000

The cost analysis assumes one Fuhrlaender FL30 wind turbine, which would be supplied FOB the Port of Seattle and complete with all necessary subsystems including tower and controllers.

The site construction estimate was also supplied by Jim Saint George, and includes turbine foundations. The construction estimate was also based on certain assumptions such as piling design foundations, and assumptions of probable soil and subsurface aquifer conditions. While the cost estimate seems reasonable under the circumstances, TDX again cautions that geotechnical work has not been completed at the probable Nikolski location and should be completed prior to construction.

The thermal storage and hot water delivery system price is based on the assumption and recommendation of 2,000 gallons of storage capacity, to be located near or adjacent to the school boiler house. The cost estimate includes the insulated storage tank and all necessary piping and pumps to circulate water at an average temperature of 170 degrees F. The hot water in the storage tank will replace or considerably offset fuel oil use for the school's thermal requirements.

The wind resource in Nikolski is so strong, that a siting recommendation from John Wade, a veteran wind power meteorologist, suggests the wind turbine should actually be placed in a semi protected location so that a prevailing wind direction can dominate over the rather typical turbid conditions. Based on a site visit with Mr. Wade, an optimal site has been identified to meet both wind resource and foundation requirements.

Sand Point

TDX Power estimates a total cost of $1,606,000 to fully construct and integrate a single unit, Fuhrlaender FL1000 wind turbine, with an associated thermal storage and delivery system. This system will tie into the existing diesel power house module with state of the art switchgear and controls designed to integrate with a wind turbine. Following is an itemized breakdown of the major components included in the cost projection:

1. 1 Fuhrlaender FL1000 wind turbine = $1,215,000
2. Site construction = $290,000
3. Thermal storage and distribution infrastructure = $61,000
4. System components shipment from Seattle = $40,000

The cost analysis assumes one Fuhrlaender FL1000 wind turbine, which would be supplied FOB the Port of Seattle and complete with all necessary subsystems including tower and controllers.

The site construction estimate was again supplied by Jim Saint George, and includes turbine foundations. The construction estimate was based on certain assumptions such as piling design foundations, and assumptions of probable soil conditions.

The thermal storage and hot water delivery system price is based on the assumption and recommendation of 20,000 gallons of storage capacity, to be located in the Sand Point school. The cost estimate includes the insulated storage tank and all necessary piping and pumps to circulate water at an average temperature of 170 degrees F. The hot water in the storage tank will replace or considerably offset fuel oil use for the school's thermal requirements.

Economic & Operational Impact of Wind Integration

TDX's analysis of the effect of wind generation on the existing diesel plants was based on a full year of local met tower wind speed measurement in St. George and sand point, and regional wind resource data for Nikolski. Unfortunately TDX was limited by partial electric load data for community load analysis in Nikolski and St. George, as the existing power generation systems were incapable of recording this data. Electric load data for Sand point was provided for an entire year on a ten minute interval. For St. George, electric load data was supplied for a single month, October 2004. Through this incremental data, however, TDX was able to create a multiplier formula which allows the October data to be extrapolated over an entire year with good accuracy.

St. George Weekday Hourly Load Profiles

Supplementing and integral to this report is a detailed spreadsheet model that calculates and presents the operational and economic impact of the wind generation systems on the existing (Sand Point and Nikolski) and proposed (St. George) diesel plants. The information which follows in this section summarizes certain data extracted from the St. George spreadsheet. To see the full presentation, all associated methodology and the support data, please refer to the CD which accompanies this report.

The overall TDX analysis logic assumed: 1) During periods of no wind, total power is supplied by the diesel generators, which also supply as-necessary intermittent charge to the thermal tank to maintain desired water temperature range. 2) In wind-diesel mode, additional load above village demand is provided based on the potential wind turbine output decrease due to normal real time variations and the desired preset margin. 3) The system's switch to wind-only mode occurs when excess wind generation (compared to actual village load) is greater than the suggested preset margin, approximately 120% of measured load, plus the potential wind turbine output decrease due to normal real time variations. 4) In wind-only mode all excess turbine generated energy is sent to the thermal storage tank.

Following is a summary of TDX's modeling results for total integrated hybrid system operations in St. George:

- Diesel only operations will consume 63,937 gallons of fuel oil annually, with total diesel plant production of 871.9 megawatt hours.
- Fully integrated with the three wind generators, the diesel operations consumption will be reduced to 38,214 gallons annually and total diesel plant production will be reduced to 514.4 megawatt hours.
- The hybrid integration reduces powerhouse fuel use by 40%.

The high penetration design allows excess energy production relative to village load during high wind speed periods. Again based on a full year, following is the amount of excess energy which would be diverted to the thermal storage tank:

- Total wind energy contribution to the thermal storage tank = 1239.9 mm Btu's
- Equivalent gallons of heating fuel supplied from wind energy = 11,653
- Net Gallons of heating fuel offset by the wind energy contribution = 11,037

The TDX model for the full year shows that adding the gross rated 300 Kilowatt wind energy component to the proposed St. George diesel plant would provide generating fuel savings of 40%, a reduction of projected consumption from 64,000 gallons to 38,000 gallons. In addition, the model shows the wind component would contribute a total of 719.6 megawatt hours, the equivalent of 11,653 gallons of fuel, to the thermal tank.

Operations and Maintenance

TDX expects that reduction of engine run time will have generally commensurate and proportional effect on diesel powerhouse maintenance expense. At minimum, the run time reduction caused by the contribution of the wind energy component will extend the otherwise expected intervals for scheduled, preventative top and bottom end inspections and maintenance.

O&M specific to the wind generation system, however, creates a new and critical category of operational responsibility and expense. Without a systematic preventative maintenance regime for the wind generators, performed by a knowledgeable and conscientious technician, TDX doubts the long term viability of such a project in these communities. Although TDX is confident that the Northwind 100 and the two Fuhrlaender turbines are of an advanced design capable of sustained duty in harsh environments, constant observation, basic care and the ability to immediately address alarm conditions is mandatory.

In TDX's experience in similar climate conditions, gearbox failure is the most common cause of catastrophic turbine failure and unscheduled downtime. This will not be a factor with the Northwind 100 as it uses a variable speed direct drive synchronous generator which eliminates a gearbox interface to the alternator. This arrangement should simplify the O&M program. Additionally, as the Northern units produce synchronous power, their use in this project would eliminate the need for a synchronous condenser, which is commonly used in hybrid designs to

condition power produced by induction machines. Elimination of the condenser not only eliminates a key maintenance item, it eliminates approximately 15 Kilowatts of system parasitic load. These features of the Northern turbine will reduce operations complexities and some costs, but will in no way negate the need for systematic O&M procedures.

The key component of a successful maintenance program is human. TDX strongly suggests that someone within these communities be identified to address this job scope. The person needs to be of sufficient health to be able to routinely climb the towers, but otherwise age or gender should make no difference. Experience in the power generation field or experience with sophisticated equipment should not be a factor. TDX believes the main ingredients required to create a capable plant operator are attitude and training. The person who will succeed will want the job and the responsibility, and will be enthusiastic about learning. With the right person, TDX believes that approximately three weeks of factory training and two weeks on site training will enable the trainee to begin functioning professionally.

From such a beginning, based on TDX's experience with similar situations, the operator will require between one and two years of steady support, which in most cases can be provided by telephone. Such ongoing contact increases operator confidence, improves system performance and pays long term dividends in lower costs and less unscheduled downtime. Northern Power, TDX or a variety of other experienced companies could provide these support services at minimal expense. Ideally, the wind plant operator would also be responsible for the entire hybrid plant, including its thermal component. TDX estimates that such an employee would expect an annual salary in the $40,000 to $50,000 per year range.

In addition to training and support programs, TDX recommends an inventory of spare parts be maintained in the three communities. Also, equipment manufacturers publish rigid service interval recommendations, and strict observance is the key to reliability. On site spares are vital, and the inventory contributes to the operator's understanding of how equipment is actually being used.

TDX suggests that the type and quantity of spares on-hand should target equipment that is either subject to high stress cycles or equipment that significantly contributes to the system's peak performance and reliability. These target areas include:

- Critical engine and control system spares
- Engine control and master control cells
- Distribution feeder cell spares
- Wind turbine and ancillary control system spares
- Thermal storage system spares

Equipment failure is most likely to occur during initial start-up through approximately the first years' operation. Repair and most parts will be covered by manufacturer's warranties in this timeframe and the spares inventory should be adjusted based on events, experience and trends.

Operations through the second and third year typically involve scheduled component change, which should follow the recommended protocol specified by the manufacturer. As is typical with virtually all new power plants, the most critical time is the fourth and fifth year of operation. During this prone-to-failure period the parts inventory should be thoughtfully adjusted to address general local experience and historical failure trends.

TDX suggest a budget of $12,800 for an adequate spare inventory covering the first full year of hybrid operations in St. George, $8,600 in Nikolski, and $39,400 in Sand Point. Based on their involvement in all three communities, TDX Power is confident it will be a le to provide the necessary support outlined above. As the owner of the Sand Point utility, primary operator of the Nikolski utility, and neighbor to the remote St. George utility (TDX Power owns and operates the high penetration wind diesel power plant on the adjacent Pribilof Island of St. Paul) TDX Power is familiar with both logistics and personnel issues in all three communities.

Schedule & Final Observations

TDX Power recommends the following schedule for completing projects in these three communities:

November 2005 – January 2006: Geotechnical Analysis in all three communities
February 2006 – April 2005: Complete design engineering for all three communities, confirm turbine orders and availability.
May 2006 – July 2006: Initial site preparation in Nikolski and St. George.
August 2006 – October 2006 – Nikolski construction
November 2006 – March 2007 – Installation of St. George power house module
April 2007 – June 2007 – Wind turbine construction in St. George
July 2007 – September 2007 – Wind turbine construction in Sand Point

As the owner and operator of rural utilities in Alaska, TDX Power operates in compliance with RUS Electric Program Regulations and Bulletins. All work proposed for these projects will be consistent with these regulations.

The communities of St. George, Sand Point and Nikolski are remote Alaskan communities completely reliant on diesel fuel for electric power generation. Diesel fuel costs continue to rise dramatically in these communities, and TDX Power is confident the addition of wind power will significantly reduce the amount of diesel fuel consumed for power generation. The region's class 7 wind regime makes these communities prime candidates for wind power, and all three communities have the infrastructure and personnel required to support these projects.

APPENDIX G: Original Project Overview

Project Design

The Aleutian Pribilof Island Association (APIA) is interested in adding wind power generation to three of the communities it represents in rural Alaska. In preparation for submission of a grant proposal to the Rural Utilities Services, APIA asked TDX Power to evaluate the cost and operating economics of integrating a wind energy generation component into the existing diesel power plants. APIA is aware that this type of wind/diesel hybrid integration now has considerable case history experience in Alaska and throughout the world. Properly located and designed, hybrid technology has successfully demonstrated the ability to significantly reduce fuel use and powerhouse maintenance through reduced engine run time. In order to evaluate the cost-benefit of wind integration in the diesel plants in these three communities, APIA also commissioned TDX Power to provide a detailed analysis of the expense and effect of adding wind generation to the planned generating facilities.

TDX Power is an Anchorage based engineering services and generation equipment provider and is the owner/operator of two regulated Alaska electric utilities, located in Sand Point and Prudhoe Bay. TDX also designed and constructed the largest high penetration, co generating wind/diesel system in Alaska, located on Saint Paul Island. The 500 Kilowatt Saint Paul hybrid plant has been awarded a variety of DOE innovation and advanced efficiency awards and has been successfully operational since 1999.

This report consists of five sections: 1) recommended hybrid system design, 2) projected installed cost of a wind generation system and its ancillary components, 3) projected impact of the wind generation system on the diesel plant's operating economics, 4) operations and maintenance program considerations and cost, and 5) Schedule and final observations.

Summary Wind/Diesel System Design

The decision path for high, medium, or low penetration includes analysis of the wind resource, the forecasted electric load and analysis of potential uses for thermal energy. The supplemental economic model, which incorporates results from multiple turbine manufacturers and configurations, suggests a high penetration design provides superior cost/benefit performance compared to low or medium penetration configurations in all three communities and therefore focused its primary attention on it.

Based on the model, TDX Power recommends a high penetration wind diesel plant with coincident thermal energy generation design for the three generating facilities. The fact that all three communities possess Class 7 rated wind resource provides the primary basis for this recommendation. In such a design, total wind generating capacity exceeds the community peak power demand by between 30% and 70%. Through such capacity and configuration, the engine

generators will literally be shut off during periods of relatively high wind speed, defined as above 16 miles per hour. Additionally and importantly, during high wind periods the high penetration design will produce excess electric energy which is converted to thermal energy and stored for use as space heating or other beneficial application through a hot water storage and distribution system.

In a low penetration design, the diesel units must continue to run regardless of wind speed. The wind generators run in constant parallel with the diesel units, which only serves to reduce load on the diesel generators. Such a configuration produces no co-generated by-product, such as hot water. And in medium penetration design, there is minimal production of a co generated by product and relatively little wind-only mode operations, which struggles to justify its investment. By sizing sufficient wind turbine generating capacity to have “wind only” generation periods, as well as the simultaneous production of a beneficial thermal product, the high penetration design produces far greater total fuel avoidance, lower engine maintenance expense, and superior long term total system operating efficiencies compared to the low or medium penetration system. Accordingly, TDX focused its analysis on the high penetration example.

As proven in the Saint Paul Island example, and dozens of similar high penetration wind/diesel installations around the world, the high penetration design functions with utility grade reliability and efficiency when properly designed, deployed and maintained. Such a system is relatively simple, using standard components. The primary building blocks of a high penetration system include the wind generation equipment, microprocessor based sensors that simultaneously monitor instantaneous load and wind speed, specialized switchgear that allow the diesels and wind turbines to function together either in parallel or singly, and a hot water storage tank with associated thermal energy delivery infrastructure.

A properly developed high penetration facility operates in diesel mode during periods of no wind, in wind-diesel parallel during moderate wind speed periods, and in full diesel-off, wind-only mode during wind periods of approximately 16 mph or higher. In a typical configuration, the electronic signal to commence wind-only mode occurs when the wind energy system is capable of producing approximately 120% of operating demand or a fixed incremental of output above the community load, for at least one hour. During these higher wind periods, the engine generator shuts off automatically and wind turbines follow community load and, in addition, supply excess energy to the water storage tank. In lower wind periods, the diesel generators supply intermittent charge to the water tank to maintain minimum temperature, typically set between 150 and 190 degrees Fahrenheit. The heated water can then be pumped through a piping and radiator network to supply space heating, or used in other beneficial community use application such as swimming pools or commercial activity. The excess-to-load wind energy offsets or eliminates heating fuel requirements.

The installation and operational cost analysis provided in this report is based on the integration of three Northwind 100 wind generators into the planned St. George diesel plant, the Fuhrlaender FL 1000 wind turbine in Sand point, and the Fuhrlaender FL 30 turbine in Nikolski. All three turbines are utility grade and will be fully supported by the respective manufacturers.

Project Management

APIA will provide financial oversight for the project. The Aleutian Pribilof Islands Association, Inc. (APIA) is a federally recognized tribal organization of the Aleut people in Alaska. APIA was chartered in 1986 as a nonprofit corporation in the State of Alaska. APIA contracts with federal, state and local governments as well as secures private funding to provide a broad spectrum of services throughout the region.

APIA has applied for, received, and successfully managed funding from a variety of state and federal agencies including: Alaska Department of Environmental Conservation, Alaska Department of Community and Economic Development, U.S. Department of Defense, U.S. Department of Energy, U.S. Department of Environmental Protection, and the National Institute for Environmental Health Sciences.

Connie Fredenberg, Natural Resources Coordinator, will oversee this project for APIA. Connie has been working relentlessly on wind energy projects in the region for the past two years. She has secured funding from several sources to further the region's projects:

- **USFWS** - Avian Interaction with Wind Energy Development in the Aleutians
- **BIA** – Wind Energy Development and Training in the Aleutians
- **USDOE/Renewable Energy on Tribal Lands** – Feasibility Studies for Wind Energy in St. George, Sand Point, Nikolski, King Cove, Adak, and False Pass

In addition to attending both levels of the Wind Energy Application and Training Symposium offered by the USDOE/National Renewable Energy Lab and Alaska's Wind-Diesel Conference she has worked directly with the Alaska Energy Authority's Renewable Energy Program to install the anemometers in four communities: St. George, False Pass, King Cove, and Nikolski and to help train local people to monitor the data collecting devices. She has also worked with the local high school science programs to involve students in the wind energy projects and to provide instruction so students can perform the avian interaction monitoring requested by USFWS. In August of this year Connie is scheduled to attend a BIA training in Juneau, Alaska for performing NEPA studies.

APIA is involved in energy conservation efforts as well as alternative energy development. The organization assisted St. George in securing funding for PowerStat meters, a pre-pay metering device which allows for close monitoring and control of energy use by households and ensures collections by the utility.

The ultimate goal of APIA is to aid communities in reducing their dependence on imported fossil fuels. Rural Alaskan communities are the canaries in the coalmine for the fossil fuel economy and many canaries are in dire straits. The Aleutian Pribilof Islands Region is considered to be "the birthplace of the wind". It makes sense that our limitless wind is the resource we should be exploiting for energy.

Contractor

APIA will contract the project construction to TDX Power, a wholly owned subsidiary of Tanadgusix Corporation (TDX) from St. Paul Island, Alaska. TDX is an ANCSA village corporation within the APIA region and a world leader in high penetration wind-diesel hybrid power generation. The Company is shareholder owned, part of the Alaskan fabric, and fully focused on Alaska's future.

TDX Power is a well-regarded owner/operator of regulated Alaska electric utilities and non-regulated independent power facilities. The Company and its management have unusual depth and experience in the development, design, finance, construction and operation of high reliability renewable and fossil fuel based power generation plants in challenging environments. TDX also supplies custom mobile and stationary power equipment packages to the military market, and provides design, development, construction, operations and finance-consulting services to power project developers in the lower 48.

Created in 1999, TDX Power has grown rapidly by leveraging its management's power industry experience and its parent's strong balance sheet to build projects and acquire Alaska utilities. The Company has 15 full time employees in various key disciplines, has asset value in excess of $20 million, and annual recurring revenue of approximately $8 million. TDX Power's primary asset base is its regulated utility operations in Sand Point and Deadhorse, Alaska, its fuel distribution business in Sand Point, and its non- regulated wind diesel power plant located on Saint Paul Island.

As demonstrated by the efficiency, reliability, safety, compliance and profitability history of the St. Paul wind diesel installation, as well as its other Alaska power generation and distribution facilities, TDX Power has the necessary depth, skills and experience to execute all power evaluation and engineering aspects of the APIA wind power project. Few companies or management teams have the level of power industry experience as TDX, particularly in the Aleutian environment.

TDX Power Key Personnel for the APIA Wind Project

TDX Power's management has a long record of accomplishment in the power industry. TDX Power's president, Bruce Levy, is a 25-year veteran of power project development, finance, and operations. TDX Power's CEO, Nick Goodman, manages the Company on a daily basis and is a well-known participant in the Alaska energy markets. Goodman is Chairman of the Renewable Energy Alaska Project (REAP), the state utility and trade group supporting development of renewable energy projects in Alaska, and is highly regarded by all the major Alaska banks, regulatory agencies and Alaskan energy institutions such as AIEDA, AEA and ADEC. The Company's chief operations officer, John Lyons, served 20 years as the Alaska Village Electric Cooperative's operations manager prior to joining TDX and has designed, built and managed the operations of over 100 energy plants in remote Alaska. TDX Power's CFO, Mike Froehlich, has extensive experience with electric utility accounting systems, insurance, construction financial management, FERC and RCA compliance and tax planning. The Company's Licensed Professional Engineering staff is among the most experienced in the industry.

TDX Power's management has long relationships and project experience with most of the world's leading small and medium sized wind power equipment suppliers. The Company's management is particularly close to Vestas, Northern Power, Fuhrlaender, Entegrity Wind Systems and Bergey. TDX expects to use a variety of these established relationships for the implementation of the APIA project.

Regulatory and Other Approvals

As the owner and operator of rural utilities in Alaska, TDX Power operates in compliance with RUS Electric Program Regulations and Bulletins. All work proposed for these projects will be consistent with these regulations.

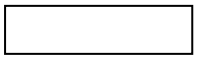
In order to erect the anemometer towers approval had to be obtained from both USFWS and FAA. We foresee no further need to obtain additional approvals, as the anemometer towers are located on the same ground we intend to install the wind turbines.

Connie Fredenberg will be attending a BIA sponsored NEPA training in August of 2005 in order to be able to complete the required NEPA studies on this project.

Goals of the Project and Performance Measures

The communities of St. George, Sand Point and Nikolski are remote Alaskan communities completely reliant on diesel fuel for electric power generation. Diesel fuel costs continue to rise dramatically in these communities, and TDX Power is confident the addition of wind power will significantly reduce the amount of diesel fuel consumed for power generation. The region's class 7-wind regime makes these communities prime candidates for wind power, and all three communities have the infrastructure and personnel required to support these projects.

TDX's analysis of the effect of wind generation on the existing diesel plants was based on a full year of local met tower wind speed measurement in St. George and Sand Point, and regional wind resource data for Nikolski. Unfortunately TDX was limited by partial electric load data for community load analysis in Nikolski and St. George, as the existing power generation systems were incapable of recording this data. Electric load data for Sand Point was provided for an entire year on a ten-minute interval. For St. George, electric load data was supplied for a single month, October 2004. Through this incremental data, however, TDX was able to create a multiplier formula that allows the October data to be extrapolated over an entire year with good accuracy.



St. George Weekday Hourly Load Profiles

Supplementing and integral to this report is a detailed spreadsheet model that calculates and presents the operational and economic impact of the wind generation systems on the existing (Sand Point and Nikolski) and proposed (St. George) diesel plants. The information, which follows in this section, summarizes certain data extracted from the St. George spreadsheet. To see the full presentation, all associated methodology and the support data, please refer to the CD, which accompanies this report.

The overall TDX analysis logic assumed: 1) during periods of no wind, total power is supplied by the diesel generators, which also supply as-necessary intermittent charge to the thermal tank to maintain desired water temperature range. 2) In wind-diesel mode, additional load above village demand is provided based on the potential wind turbine output decrease due to normal real time variations and the desired preset margin. 3) The system's switch to wind-only mode occurs when excess wind generation (compared to actual village load) is greater than the suggested preset margin, approximately 120% of measured load, plus the potential wind turbine output decrease due to normal real time variations. 4) In wind-only mode all excess turbine generated energy is sent to the thermal storage tank.

Following is a summary of TDX's modeling results for total integrated hybrid system operations in St. George:

- Diesel only operations will consume 63,937 gallons of fuel oil annually, with total diesel plant production of 871.9 megawatt hours.
- Fully integrated with the three wind generators, the diesel operations consumption will be reduced to 38,214 gallons annually and total diesel plant production will be reduced to 514.4 megawatt hours.
- The hybrid integration reduces powerhouse fuel use by 40%.

The high penetration design allows excess energy production relative to village load during high wind speed periods. Again based on a full year, following is the amount of excess energy that would be diverted to the thermal storage tank:

- Total wind energy contribution to the thermal storage tank = 1239.9 mmBtu's
- Equivalent gallons of heating fuel supplied from wind energy = 11,653
- Net Gallons of heating fuel offset by the wind energy contribution = 11,037

The TDX model for the full year shows that adding the gross rated 300 Kilowatt wind energy component to the proposed St. George diesel plant would provide generating fuel savings of 40%, a reduction of projected consumption from 64,000 gallons to 38,000 gallons. In addition, the model shows the wind component would contribute a total of 719.6 megawatt hours, the equivalent of 11,653 gallons of fuel, to the thermal tank.

Operations and Maintenance

TDX expects that reduction of engine run time will have generally commensurate and proportional effect on diesel powerhouse maintenance expense. At minimum, the run time reduction caused by the contribution of the wind energy component will extend the otherwise expected intervals for scheduled, preventative top and bottom end inspections and maintenance.

O&M specific to the wind generation system, however, creates a new and critical category of operational responsibility and expense. Without a systematic preventative maintenance regime for the wind generators, performed by a knowledgeable and conscientious technician, TDX doubts the long-term viability of such a project in these communities. Although TDX is confident that the Northwind 100 and the two Fuhrlaender turbines are of an advanced design capable of sustained duty in harsh environments, constant observation, basic care and the ability to immediately address alarm conditions is mandatory.

In TDX's experience in similar climate conditions, gearbox failure is the most common cause of catastrophic turbine failure and unscheduled downtime. This will not be a factor with the Northwind 100 as it uses a variable speed direct drive synchronous generator that eliminates a gearbox interface to the alternator. This arrangement should simplify the O&M program.

Additionally, as the Northern units produce synchronous power, their use in this project would eliminate the need for a synchronous condenser, which is commonly used in hybrid designs to condition power produced by induction machines. Elimination of the condenser not only eliminates a key maintenance item, it eliminates approximately 15 Kilowatts of system parasitic load. These features of the Northern turbine will reduce operations complexities and some costs, but will in no way negate the need for systematic O&M procedures.

The key component of a successful maintenance program is human. TDX strongly suggests that someone within these communities be identified to address this job scope. The person needs to be of sufficient health to be able to routinely climb the towers, but otherwise age or gender should make no difference. Experience in the power generation field or experience with sophisticated equipment should not be a factor. TDX believes the main ingredients required to create a capable plant operator are attitude and training. The person who will succeed will want the job and the responsibility, and will be enthusiastic about learning. With the right person, TDX believes that approximately three weeks of factory training and two weeks on site training will enable the trainee to begin functioning professionally.

From such a beginning, based on TDX's experience with similar situations, the operator will require between one and two years of steady support, which in most cases can be provided by telephone. Such ongoing contact increases operator confidence, improves system performance and pays long-term dividends in lower costs and less unscheduled downtime. Northern Power, TDX or a variety of other experienced companies could provide these support services at minimal expense. Ideally, the wind plant operator would also be responsible for the entire hybrid plant, including its thermal component. TDX estimates that such an employee would expect an annual salary in the $40,000 to $50,000 per year range.

In addition to training and support programs, TDX recommends an inventory of spare parts be maintained in the three communities. Also, equipment manufacturers publish rigid service interval recommendations, and strict observance is the key to reliability. On site spares are vital, and the inventory contributes to the operator's understanding of how equipment is actually being used.

TDX suggests that the type and quantity of spares on-hand should target equipment that is either subject to high stress cycles or equipment that significantly contributes to the system's peak performance and reliability. These target areas include:

- Critical engine and control system spares
- Engine control and master control cells
- Distribution feeder cell spares
- Wind turbine and ancillary control system spares
- Thermal storage system spares

Equipment failure is most likely to occur during initial start-up through approximately the first years' operation. Repair and most parts will be covered by manufacturer's warranties in this timeframe and the spares inventory should be adjusted based on events, experience and trends. Operations through the second and third year typically involve scheduled component change, which should follow the recommended protocol specified by the manufacturer. As is typical with virtually all new power plants, the most critical time is the fourth and fifth year of operation. During this prone-to-failure period the parts inventory should be thoughtfully adjusted to address general local experience and historical failure trends.

TDX suggest a budget of $12,800 for an adequate spare inventory covering the first full year of hybrid operations in St. George, $8,600 in Nikolski, and $39,400 in Sand Point. Based on their involvement in all three communities, TDX Power is confident it will be able to provide the necessary support outlined above. As the owner of the Sand Point utility, primary operator of the Nikolski utility, and neighbor to the remote St. George utility (TDX Power owns and operates the high penetration wind diesel power plant on the adjacent Pribilof Island of St. Paul) TDX Power is familiar with both logistics and personnel issues in all three communities.

Wind System Installation Cost

St. George

TDX Power estimates a total cost of $1,086,000 to fully construct and integrate a three unit, Northwind 100 wind generation facility, with an associated thermal storage and delivery system. This system will tie into a new diesel powerhouse module that will be installed at the same time, to meet the 225 kw average electric load in the community. Funding for the diesel powerhouse has been secured from a separate source and is not part of the grant application to RUS. Following is an itemized breakdown of the major components included in the cost projection:

5. 3 Northwind 100 wind turbines = $765,000
6. Site construction = $280,000
7. Thermal storage and distribution infrastructure = $21,000
8. System components shipment from Seattle = $20,000

The cost analysis assumes three Northwind 100 machines, which would be supplied FOB the Port of Seattle and complete with all necessary subsystems including towers and controllers. TDX Power believes that the wind energy component of the new diesel power plant system must have at least 250 kilowatts of total gross capacity in order to achieve optimum wind-only mode, high penetration design results. As any less than three Northwind generators do not meet the capacity criteria, three are suggested and modeled.

The site construction estimate was supplied by Jim Saint George, an experienced civil contractor in western Alaska with experience installing wind turbines, and includes turbine foundations. The construction estimate was based on certain assumptions such as piling design foundations, and assumptions of probable soil and subsurface aquifer conditions. While the cost estimate seems reasonable under the circumstances, TDX cautions that geotechnical work has not been

completed at the probable St. George location and subject to these further investigations, the construction cost estimate could change.

TDX Power understands the diesel powerhouse module will have Kohler paralleling switchgear in a five-section line up. This equipment contains circuit breakers and PLC based controls, a master control section and a section for feeder control. The Kohler system is controlled from a local touch screen and capable of remote operation via a standard WEB browser. The operator interface uses the Advantech touch screen for alarm display, alarm and status logging (500 events), user selectable remote alarms, digital synchronizer, digital real (KW) and reactive (KVAR) load sharing, system information and data display, manual synchronizing and operator control. The engine generator control cells, master section and sectionalizing cells are bussed together. The main buss is rated at 2,000 amps at a typical buss voltage of 480, 3-phase, 4-wire. The Kohler system has the ability to control and monitor a variety of diesel/generator equipment and provides operating personnel with the ability to operate in a total manual mode in the event of PC or PLC failure.
The thermal storage and hot water delivery system price is based on the assumption and recommendation of 8,000 gallons of storage capacity, to be located near or adjacent to the St. George school boiler house. The cost estimate includes the insulated storage tank and all necessary piping and pumps to circulate water at an average temperature of 170 degrees F. The hot water in the storage tank will replace or considerably offset fuel oil use for the school's thermal requirements.

A power plant site plan has been developed with three turbines sited around the power plant. The siting of the wind turbines is somewhat subjective at this point, pending a geotechnical evaluation. However, a rough estimate of where the wind turbines could be placed was prepared to provide a general idea of distances. Both Northern Power and Fuhrlaender wind turbines should have the minimum 2 1/2 - 3 rotor diameters between them, and no less than 10 diameters downwind. Based on data produced from a year's wind resource data from an on site anemometer, we have assumed the prevailing winds are westerly, southwesterly.

Nikolski
TDX Power estimates a total cost of $261,000 to fully construct and integrate a single unit, Fuhrlaender FL30 wind generation facility, with an associated thermal storage and delivery system. This system will tie into a diesel powerhouse module that was recently installed by the Alaska Energy Authority to support the average 25 kw electric load for the community. Following is an itemized breakdown of the major components included in the cost projection:

5. 1 Fuhrlaender FL30 wind turbine= $145,000
6. Site construction = $85,000
7. Thermal storage and distribution infrastructure = $11,000
8. System components shipment from Seattle = $20,000

The cost analysis assumes one Fuhrlaender FL30 wind turbine, which would be supplied FOB the Port of Seattle and complete with all necessary subsystems including tower and controllers.

The site construction estimate was also supplied by Jim Saint George, and includes turbine foundations. The construction estimate was also based on certain assumptions such as piling design foundations, and assumptions of probable soil and subsurface aquifer conditions. While the cost estimate seems reasonable under the circumstances, TDX again cautions that geotechnical work has not been completed at the probable Nikolski location and should be completed prior to construction.

The thermal storage and hot water delivery system price is based on the assumption and recommendation of 2,000 gallons of storage capacity, to be located near or adjacent to the school boiler house. The cost estimate includes the insulated storage tank and all necessary piping and pumps to circulate water at an average temperature of 170 degrees F. The hot water in the storage tank will replace or considerably offset fuel oil use for the school's thermal requirements. The wind resource in Nikolski is so strong, that a siting recommendation from John Wade, a veteran wind power meteorologist, suggests the wind turbine should actually be placed in a semi protected location so that a prevailing wind direction can dominate over the rather typical turbid conditions. Based on a site visit with Mr. Wade, an optimal site has been identified to meet both wind resource and foundation requirements.

Sand Point

TDX Power estimates a total cost of $1,626,000 to fully construct and integrate a single unit, Fuhrlaender FL1000 wind turbine, with an associated thermal storage and delivery system. This system will tie into the existing diesel powerhouse module with state of the art switchgear and controls designed to integrate with a wind turbine. Following is an itemized breakdown of the major components included in the cost projection:

5. 1 Fuhrlaender FL1000 wind turbine = $1,215,000
6. Site construction = $310,000
7. Thermal storage and distribution infrastructure = $61,000
8. System components shipment from Seattle = $40,000

The cost analysis assumes one Fuhrlaender FL1000 wind turbine, which would be supplied FOB the Port of Seattle and complete with all necessary subsystems including tower and controllers.

The site construction estimate was again supplied by Jim Saint George, and includes turbine foundations. The construction estimate was based on certain assumptions such as piling design foundations, and assumptions of probable soil conditions.

The thermal storage and hot water delivery system price is based on the assumption and recommendation of 20,000 gallons of storage capacity, to be located in the Sand Point School. The cost estimate includes the insulated storage tank and all necessary piping and pumps to circulate water at an average temperature of 170 degrees F. The hot water in the storage tank will replace or considerably offset fuel oil use for the school's thermal requirements.

Schedule & Final Observations

TDX Power recommends the following schedule for completing projects in these three communities:

November 2005 – January 2006: Geotechnical Analysis in all three communities
February 2006 – April 2005: Complete design engineering for all three communities, confirm turbine orders and availability.
May 2006 – July 2006: Initial site preparation in Nikolski and St. George.
August 2006 – October 2006 – Nikolski construction
November 2006 – March 2007 – Installation of St. George powerhouse module
April 2007 – June 2007 – Wind turbine construction in St. George
July 2007 – September 2007 – Wind turbine construction in Sand Point

APPENDIX H: Wind Turbine Generator System Engineering, Procurement, and Construction Agreement

This Wind Turbine Generator System Engineering, Procurement and Construction Agreement ("Agreement") is entered into this ___ day of October 2006 by and among TDX Power Services LLC, an Alaska limited liability company, with its principal offices located at 4300 "B" Street, Suite 402, Anchorage, Alaska 99503 ("Contractor"), the Aleutian Pribilof Islands Association, Inc., an Alaska non-profit corporation, with its principal offices located at 201 East 3rd Avenue, Anchorage, Alaska ("APIA" or "Association") and Umnak Power Company, an electric utility organized under the laws of the State of Alaska, with its principal offices located at Nikolski, Alaska ("Umnak"). Association, Umnak and Contractor are sometimes hereinafter referred to collectively as the "Parties" and individually as a "Party."

Recitals

Whereas, the Association is a federally recognized non-profit tribal association of the Aleut people and includes among its members the village of Nikolski, located on Umnak Island in the Aleutian chain; and

Whereas, Umnak Power Company is the tribally owned electric utility for the community of Nikolski; and

Whereas, Chaluka Corporation, owner of the wind turbine generator site has granted Umnak Power Company approval to use said property for the installation of the wind turbine generator system pursuant to an authorization letter dated April 13, 2006 ("Authorization"); and

Whereas, the Association has received a grant for the purchase and installation of a re-conditioned and retrofitted wind turbine generator to supplement the existing diesel powered electric generating station that currently supplies electricity to the residents of Nikolski; and

Whereas, the Association has received all required approvals from the village government of Nikolski to serve as agent in the procurement and installation of the re-conditioned wind turbine generator; and

Whereas, Contractor has the required experience to procure and install the re-conditioned wind turbine generator; and

Whereas Contractor is prepared to provide the requested equipment and services on the terms set out below; and

Now therefore, in consideration of the mutual covenants contained herein, the sufficiency of which is acknowledged by all Parties, the Parties hereby agree as follows:

1. ***Scope of Work.*** The Contractor shall fully execute the Phase 1 Work described in the USDA Grant Proposal documents, attached as Exhibit D, and herein incorporated by reference, and within design parameters applicable to installation of a wind turbine in Nikolski, Alaska ("Site"). The Contractor shall be responsible for procuring or furnishing the design and for the construction of the Work consistent with the installation of one fully functioning 65kw Wind Turbine Generator System ("WTG") and associated equipment and interconnection to the newly commissioned diesel fuel based power plant in Nikolski, Alaska. The Contractor shall exercise reasonable skill and judgment in the performance of the Work that exhibits a good faith effort to meet all applicable wind energy industry safety, quality, and engineering requirements.

Contractor shall provide to the Association for its review and approval, design documents sufficient to establish the size, quality, and character of the Work; its structural, mechanical, and electrical systems; and the materials and such other elements of the Work to the extent required for a complete project.

Contractor agrees to design, procure, and install, on the terms set out below, one Vestas V-15 65 kilowatt remanufactured and retrofitted wind turbine ("Turbine"), associated equipment, and site work at the Site. Umnak Power represents and warrants that the Site is of sufficient size to accommodate the Turbine and associated equipment, and Umnak Power shall cause the Native Village of Nikolski to provide unrestricted access to the Site for purposes of evaluation and installation. The Turbine and associated equipment are described more fully in Exhibit B attached hereto. Contractor covenants that it will have good title to the Turbine and associated equipment (collectively the "Equipment"), and that there will be no liens or other encumbrances on such Equipment once it is installed. Specific tasks to be performed under this Agreement are specified in Exhibit A attached hereto.

The date of commencement of the Work shall be the date of this Agreement.

The Contractor shall keep the Association and Umnak informed of the progress and quality of the Work.

The Contractor is responsible for completion of the Work and shall maintain an adequate quality control system and perform such inspections as will ensure that the work performed under this Agreement conforms to the Scope of Work. The Contractor shall maintain complete inspection and testing records and make them available to the Association and Umnak.

Barring Force Majeure events, or delays caused by the Association or Umnak Power, Contractor will complete installation of the Turbine by September 30, 2007 ("Substantial Completion"). For purposes of this Agreement, "Force Majeure" means events (i) beyond the control of a Party (ii) that were not reasonably foreseeable (iii) that occurred without the fault or negligence of such Party, and which (iv) prevent or delay the performance of a Party's obligations hereunder.

Association and Umnak Power acknowledge that integration of the Turbine with the existing diesel generating facility will require additional time following the installation of the Turbine. Contractor agrees to use reasonable efforts to complete the evaluation and submittal of a written report of the feasibility of such integration by December 31, 2007.

2. Documentation; Progress Reports to the Association and Umnak Power. Contractor shall maintain and provide one copy to the Association and Umnak Power of all relevant documentation relating to the Turbine performance at commissioning. Documentation shall include turbine operations/maintenance manual, and results of the performance testing. Contractor will provide the Association with a monthly written update on the status of the Work and expenditures so that APIA can meet its reporting obligations to its funding agency.

Association and Umnak Power shall also have access to the Site to enable them to stay informed about the progress and quality of the Work at reasonable times, subject to advance notice, and compliance with Contractor's safety requirements. Neither the Association nor Umnak shall have control over, nor charge of, nor be responsible for, the construction means, methods, techniques, sequences, or procedures, nor for the safety precautions and programs in connection with the Work; these are solely the Contractor's rights and responsibilities.

Association and/or Umnak Power shall have the right to review and comment upon Contractor's submittals, including but not limited to design and construction documents, shop drawings and product data, but only for the limited purpose of checking for conformance with information given and the design concept. Such review shall be taken with reasonable promptness as to cause no delay in the Work. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of details, such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which shall remain the responsibility of the Contractor.

3. Independent Contractor. Contractor is an independent contractor (and is not the agent or representative of the Association or Umnak Power) in the performance of this Agreement. This Agreement shall not be interpreted or construed as (i) creating or evidencing any association, joint venture, partnership or franchise between the Parties, (ii) imposing any partnership or franchise obligation or liability on either Party, or (iii) prohibiting or restricting Contractor's performance of any services for any third party.

4. Terms of Payment and Delivery. The Association agrees to pay Contractor four hundred fifty four thousand seven hundred five dollars ($454,705) ("Contract Sum") for the Work.

Based on applications for payment submitted to the Association by the Contractor, the Association shall make progress payments against the Contract Sum to the Contractor as provided below.

The period covered by each application for payment shall be one calendar month, ending on the last day of the month.

The Contractor shall submit to the Association, before the first Application for Payment, a Schedule of Values allocated to various portions of the Work prepared in such form and supported by such data to substantiate its accuracy. This schedule shall provide the basis for reviewing the Contractor's Applications for Payment.

The Contractor shall submit to the Association an itemized Application for Payment for that portion of the Work completed as of the end of the period covered by the Application for Payment.

Payments shall be made for materials and equipment delivered and suitably stored at the Site for subsequent incorporation in the Work. If approved in advance by APIA, payment may similarly be made for materials and equipment suitably stored off the Site at a location agreed to in writing. Payment for materials and equipment stored on or off Site shall be conditioned upon compliance by the Contractor with procedures satisfactory to APIA to establish APIA's title to such materials and equipment or otherwise protect APIA's interest and shall include the costs of applicable insurance, storage, and transportation to the Site for such materials and equipment stored off the Site.

The amount of each progress payment shall be the Contract Sum properly allocated to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to the portion of the Work in the schedule of values, less retainage of ten percent (10%) on the Work.

The Association may withhold a payment in whole or in part to the extent necessary to protect the Association due to the Association's determination that the Work has not progressed to the point indicated in the Application for Payment or that the quality of Work is not in accordance with the design documents. Should the Association exercise this right, it shall escrow the disputed funds with a third party escrow agent acceptable to Contractor, and shall provide a written explanation for its determination.

The Contractor understands and agrees that this Agreement is based on an established budget, which is defined in Exhibit C, and herein incorporated by reference, and in no event shall the total amount invoiced for this Agreement exceed the Contract Sum, absent Force Majeure Events, or delays caused by the Association or Umnak Power.

Payments shall be due within 30 days of the Association's receipt of Contractor's invoice. Any amount not paid when due shall be subject to finance charges equal to 1% per month or the highest rate permitted by applicable usury law, whichever is less, determined from the date due until the date paid. Contractor may accept any check or payment in any amount without prejudice to Contractor's right to recover the balance of the amount due or to pursue any other

right or remedy. No endorsement or statement on any check or payment or in any letter accompanying a check or payment or elsewhere shall be construed as an accord or satisfaction.

In the event payment is delayed more than sixty days from the due date, Contractor may suspend its performance under this Agreement without liability to the Association. In the event payments are not received within 90 days of the due date, Contactor may terminate this Agreement, and seek all available remedies at law or in equity against the Association, including its costs of demobilization from the site, any amounts owed to Vestas, and lost profit.

In the event the Association desires to change the scope of Work, it shall request a change order from Contractor. Contractor shall provide a written proposal in response to the request for the change order. Prior to implementing the change order, Contractor may insist on proof of funding from the Association to cover the cost of the change order.

Upon receipt of written notice from Contractor that the Work is ready for final inspection and acceptance, and upon receipt of final Application for Payment, the Association and Umnak Power shall promptly make such inspection and, when the Association finds the Work acceptable, in accordance with the design documents, and fully performed, the Association shall make final payment to the Contractor. Approval of the Work shall not be unreasonably withheld or delayed. Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Association to the Contractor no later than 30 days after Contractor has completed the Work.

5. ***Limited Warranties.*** The Contractor agrees to correct all Work performed under this Agreement which proves to be defective in workmanship or materials within a period of one year from the date of Substantial Completion

Turbine & Equipment Warranty. Contractor warrants to the Association and Umnak Power for a period of one year from the date of Substantial Completion of the Turbine and associated equipment installed in Nikolski that (i) it has good title to the Turbine, free of liens and encumbrances (ii) the Turbine as delivered shall comply in all material respects with the specifications and other requirements set forth in the scope of work set out in Exhibits A and B, and (iii) shall be free from defects in materials and workmanship (collectively "Defects"). Notwithstanding the foregoing, the warranty against Defects provided by Contractor shall be limited to the warranty provided by Halus as the vendor of the remanufactured turbine. Contractor shall provide Association and Umnak Power with a copy of such warranty, and will assign the warranty to them, assuming Halus will consent to such assignment. In the event assignment is not authorized by Halus, upon notification of a warranty claim, Contractor shall commence, or cause Vestas to commence, repair or replacement of the defective Work within a reasonable time after receipt of the claim, and continue the repair/replacement on an uninterrupted basis until the warranty work is completed to the reasonable satisfaction of the Association and Umnak Power, and the Defect is corrected.

With the assistance of the Umnak maintenance personnel, the Contractor shall direct the checkout and start-up operations, and adjusting and balancing of system and equipment readiness.

To the extent covered by the Vestas warranty, Contractor agrees as follows:

All components of the Turbine shall be warranted against Defects for a period of one year from the Substantial Completion date. Labor, parts, shipping, and travel costs to repair or replace any components of the Turbine covered by this warranty are included, but are subject to the following remote location terms:

a. Due to the remote location of the village of Nikolski, travel or shipping costs incurred for personnel, parts or equipment required for repair or replacement of parts covered by the limited warranty are to be shared between Contractor and Umnak Power in the following manner: Contractor will pay for personnel, parts or equipment travel or shipping expenses incurred due to warranty coverage to and from vendor's site and Anchorage, AK. Travel or shipping charges for personnel, parts, or equipment incurred due to warranty coverage from Anchorage, AK to the turbine site in the village of Nikolski are to be paid by Umnak Power.

b. In the case of warranty work involving labor and equipment within the scope of what Umnak Power can reasonably perform, Umnak Power agrees to make a good faith effort to perform needed repair or warranty work, with parts supplied by Contractor, subject to Contractor reimbursing Umnak Power for the reasonable cost of Umnak Power's labor to perform the warranty work.

c. Umnak Power agrees to perform regular scheduled maintenance on the Turbine according to the Vestas maintenance manual, a copy of which shall be provided by Contractor to Umnak Power.

d. Rights under this limited warranty are not assignable by the Association or Umnak Power without the approval of Contractor, which approval shall not be unreasonably withheld or delayed.

The Contractor further represents, warrants, and agrees as follows:

(i) The Turbine, upon completion of re-manufacturing, shall meet the specifications set out in Exhibit B hereto;

(ii) Contractor owns the Turbine and all components thereof, free and clear of all claims and liens of third parties; and has full right, power, and authority to convey the Turbine to the Association or Umnak Power without the consent or approval of any third-party.

The foregoing warranty does not cover:

a. Damage to the Turbine or any of its components caused by unauthorized use or service.

b. Damage to the Turbine or any of its components caused by faults relating to the electrical system to which the Turbine is connected, including but not limited to voltage, current and frequency ranges outside those specified in manufacturer (Vestas) product manual.

c. Damage to the Turbine or any of its components caused by acts of God, including but not limited to, hail, lightning, earthquakes, wind in excess of operating ranges specified in the Vestas product manual (but excluding any damage that could have been prevented by proper operation of Turbine shut off devices), hurricanes, tornados, volcanic eruptions, icing of any kind including but not limited to rime icing.

d. Damage to Turbine or any of its components caused by any form of intentional abuse or misuse including, but not limited to, theft or vandalism.

e. Damage to the Turbine or any of its components caused by any form of unintentional, reckless, or negligent abuse or misuse.

6. Exclusivity. The warranty and remedies set forth above are exclusive. Contractor makes no representation or warranty, express or implied, with regard to any services, results or other items under this Agreement (including, without limitation, any implied warranty of merchantability or fitness for a particular purpose or any implied warranty arising out of course of performance, course of dealing or usage of trade).

7. Warranty Service. In order to obtain warranty service, the Association or Umnak Power must notify Contractor within 15 days after the Association or Umnak Power becomes aware of any malfunction. Notice must be provided as set forth below.

8. Indemnification; Limitations on Contractor's Liability. Contractor shall indemnify and hold Association and Umnak Power harmless from liability resulting from the negligent acts or omissions of Contractor, its agents or employees pertaining to the activities to be carried out pursuant to this Agreement, including but not limited to any and all claims for real and/or personal property damage and/or bodily damage; provided, however, that Contractor shall not be required to indemnify or hold the Association and Umnak Power harmless from liability arising out of the negligence or willful malfeasance of or any person or entity not subject to Contractor's supervision or control.

In no event shall Contractor be liable for loss of use, loss of profits, business interruption or other consequential, indirect, special, incidental or punitive damages, however they may be caused. Contractor's total liability under this Agreement, for any reason, and arising from any cause, shall be limited to the Contract Sum.

The Association shall indemnify and hold Contractor and Umnak Power, its officers, directors, agents and employees harmless from and against any liability or loss arising from the performance of the Association's obligations under this Agreement, including those resulting from the negligent acts or omissions of the Association or the activities to be carried out by the Association pursuant to this Agreement.

Umnak Power shall indemnify and hold Contractor and the Association, its officers, directors, agents, and employees harmless from and against any liability or loss arising from the performance of the Umnak's obligations under this Agreement, including those resulting from the negligent acts or omissions of Umnak or the activities to be carried out by Umnak pursuant to this Agreement.

9. ***Notices/Contact Info.*** Unless notified in writing of a change, the contact info below shall apply for each Party. All notices required hereunder shall be in writing and shall be deemed to have been given when sent by registered or certified mail, postage prepaid and addressed to the last known address of the Party being notified.

a. Association: Aleutian Pribilof Islands Association, Inc.
201 East 3rd Avenue,
Anchorage, Alaska
Attn: Mr. Dimitri Philemonof

Email: dimitrip@apiai.org
Phone: 907-276-2700

b. Contractor: TDX Power Services LLC
4300 "B" Street, Suite 402
Anchorage, Alaska
Attn: Mr. Nick Goodman

Email: ngoodman@tdxpower.com
Phone: 907-278-2312

c. Utility: Umnak Power
PO Box 105
Nikolski, Alaska
Attn: Ms. Tanya Kyle

Email: ikotribeadmin@ak.net
Phone: 907-576-2225

10. Counterparts. This Agreement may be executed in two or more counterparts, each of which shall be deemed to be an original, but all of which together shall constitute but one and the same instrument. Executed counterparts transmitted by fax shall be binding on the Parties.

11. Successors and Assigns. This Agreement may not be assigned by any Party without the consent of the other Parties, except that Association may assign this Agreement as collateral for any financing used to purchase the Turbine without the consent of Contractor. The Association may assign its rights and responsibilities to Umnak Power without the consent of the Contractor. This Agreement shall be binding upon, and inure to the benefit of, the successors and assigns of the Parties.

12. Attorneys Fees. If any Party to this Agreement commences arbitration for the interpretation, enforcement, termination, cancellation, or rescission of this Agreement, or for damages for the breach of the same, the prevailing Party, as determined by the arbitrator, shall be entitled to its reasonable attorney fees and other costs incurred.

13. Interpretation. This Agreement has been negotiated by the Parties which are knowledgeable in the matters contained herein and the Parties represent to each other that they

have either consulted with legal counsel, or have had the opportunity to do so, and thus, this Agreement is to be construed and interpreted in absolute parity, and shall not be construed or interpreted against any Party by reason of its participation in the drafting of the Agreement.

14. Severability. If any term or provision of this Agreement shall be determined to be illegal or unenforceable, all other terms and provisions in this agreement as well as the Agreement shall nevertheless remain effective and shall be enforced to the fullest extent permitted by law.

15. Exercise of Remedies. No failure on the part of either Party to exercise and no delay in exercising any right or remedy hereunder, at law or equity, shall operate as a waiver thereof.

16. Dispute Resolution. The Parties of this Agreement agree to submit any disputes arising from this Agreement to final and binding arbitration before a single arbitrator under the Commercial Rules of the American Arbitration Association. Any such arbitration proceeding shall be held in Anchorage, Alaska or other location mutually agreeable to all Parties. The Parties further agree that the arbitrator's fee shall be the mutual responsibility of the Parties, with each Party responsible for its share of the same. Each Party shall be responsible for the travel expenses of its own representatives and/or witnesses. The award of the arbitrator shall be binding on the Parties, and may be enforced in any court of competent jurisdiction

17. Applicable Law. The substantive laws of the State of Alaska and applicable federal laws shall govern the construction of this Agreement and the rights and remedies of the Parties hereto. Should any action or proceeding relating to this Agreement be commenced to enforce an arbitration award, or the obligation to arbitrate, the Parties agree to submit to the personal jurisdiction of any state or federal court sitting in the State of Alaska and hereby waive any claims that such forum is inconvenient or there is a more convenient forum located elsewhere.

18. Representations and Warranties. Each Party represents and warrants to the other Parties that the execution, delivery and performance of this Agreement have been duly authorized by all required company action, that the person executing this Agreement on behalf of such Party has full authority to do so, and that there are no third party consents required for the execution, delivery or performance of this Agreement by said Party. Association also represents and warrants that it has the required funds to pay for the Work, and that it has all required authorizations to serve as the agent of the Village of Nikolski under this Agreement.

Contractor acknowledges, represents, and agrees that it has not relied in any fashion on any representation or warranty by APIA or Umnak as to (i) the buildability or other feature of the Site, or (ii) the construction methods that can or will be employed.

19. Certain Covenants of Contractor. Contractor will provide the Association a certificate of insurance for general liability, auto, and worker's compensation insurance in

amounts required by applicable state law. A completed W-9 Taxpayer I.D. Number Certification form and a copy of Contractor's current Alaska Business License will also be provided to the Association.

20. ***Complete Agreement.*** This Agreement constitutes the entire understanding of the Parties with respect to the subject matter hereof, and supersedes all prior written or oral understandings. This Agreement may only be modified by a written amendment executed by all Parties.

IN WITNESS WHEREOF, the Parties have executed this Agreement as of the day and year first above written.

AGREED on the dates appearing below.

TDX Power Services LLC

By: _____Date:_____

Nicholas Goodman
CEO

Aleutian Pribilof Islands Association, Inc

By: _____Date:_____

Dimitri Philemonof
President/CEO

Umnak Power Company

By: _____Date:_____

Arnold Dushkin
President Nikolski IRA Council

Exhibit A: Scope of Work

The Contractor shall procure or furnish the design, materials, equipment, labor, permits and supervision to construct one fully operational 65 kilowatt Wind Turbine Generator System (WTGS) and associated equipment and interconnect to the newly commissioned diesel fuel based power plant in Nikolski in accordance with the International Electrotechnical Commission (IEC) Wind Turbine Standards. The Work shall include all subsystems of WTGS such as control and protection mechanisms, internal electrical systems, mechanical systems, support structures, foundations, and interconnection to the existing Nikolski power plant.

Contractor shall ensure specific requirements for the safety of WTGS, including design, installation, maintenance, and operation under the Nikolski site environmental conditions. Its purpose is to provide the appropriate level of protection against damage from all hazards from these systems during the planned WTGS lifetime.

The Contractor shall purchase a 65 kilowatt Vestas V-15 Wind Turbine (or approved equal) that has been retrofitted within certain design parameters applicable to installation of a wind turbine in Nikolski, Alaska and ship the Turbine and associated equipment to the Nikolski project site.

The Contractor shall complete all site assessment work necessary prior to installing the wind turbine, including an engineering evaluation and design for the foundation and tower, as appropriate for all site work to be accomplished within the approved budget. The Parties acknowledge that the soil conditions may differ materially from what is expected. Accordingly the budget provides for a contingency amount ($8,080). The Parties agree that this contingency shall not be expended for any purpose other than differing site conditions until the completion of site excavation and final foundation design. After this time, such funds may be expended for discretionary changes to the Project.

The Contractor shall utilize the local Nikolski workforce whenever possible.

The Contractor shall provide an evaluation and written report on the integration of the WTGS with the existing diesel power plant, recommending modifications, if any, of the diesel controls and system operability where necessary.

The Contractor shall procure or furnish to Umnak all guarantees, warranties, spares and maintenance manuals that are called for in the specifications or that are normally provided by a manufacturer. The maintenance manual shall include a catalog and price list of any equipment, materials, supplies, or parts used in inspection, calibration, maintenance, or repair of the equipment

Upon completion of the installation, the Contractor shall provide training to local utility employees on operations and maintenance of the WTGS. The Contractor shall provide ongoing support for a period of two years from date of Substantial Completion to assist with parts and

materials, ongoing training, and annual maintenance, including a minimum of two site visits during the two year period.

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Exhibit B: Specifications of V15 Wind Turbine

Tower
*Lattice mast
*74 ft high
*Hot-galvanized surface

Generators
*Induction generators
*Ratings
*Main generator: 65 kw
*Small generator: 12.6 kw
*480 VAC; 3-phase; 60 Hz

Yawing System
*Control: Windvane (electronic)
*Yawing speed: 72 degrees/min

Rotor
*50 ft diameter
*52.7 or 42.2 rpm rotational speed, clockwise
*Upwind orientation

Blades
*Glasfiber reinforced polyester
*1972 sq ft swept area

Operational Data
*Cut-in windspeed: 8.9 mph
*Cut-off windspeed: 62 mph
*Survival windspeed: 100 mph

Miscellaneous
*Entire assembly (turbine, rotor, tower) weighs approx. 16,700 lbs.
*Blades are fixed, but pitch can be adjusted to optimize performance for your site.
*Controller monitors turbine function and automatically shuts down in event of malfunction.
*When wind speed exceeds 62 mph, generator is taken off power network and brakes bring rotor to halt.

PERFORMANCE ESTIMATE

Wind Speed (mph)	Power Output (kw)
0-8.9	0
10	4
15	13
20	26
25	50
30	61
35	68
40	71
45	68
50	65

55	65
60	63

Exhibit C: Budget

Project Budget Estimate
Nikolski - Phase 1 - Wind Turbine Project
Price for One Vestas V-15 Wind Turbine Generator System Installed

Function	Budget
Design/Engineering	$ 7,500.00
Consulting - Contract	$ 15,000.00
Excavation and Civil	$ 12,500.00
Permitting	$ 5,000.00
Foundation Materials	$ 31,000.00
Foundation Construction	$ 24,000.00
Freight	$ 35,000.00
Tower Assembly (misc)	$ 9,500.00
Lattice Tower Assembly	$ 4,500.00
Tower Erected w/equipment	$ 7,500.00
Freight	$ 9,500.00
Turbine (Retrofitted)	$ 68,000.00
Turbine Assembly (misc.)	$ 6,500.00
Freight	$ 8,500.00
Halus Visit (John)	$ 4,500.00
Control and Grid Connect	$ 85,000.00
Mechanical/Thermal Tanks	$ -
Control/Electrical - Thermal use	$ -
Freight	$

	15,000.00
Start-Up and Functional Testing	$ 8,600.00
(Halus and TDX Power)	
Crew (room & board)	$ 11,500.00
Air fare - Nikolski (2 tech's, 4ea - RT)	$ 8,300.00
Incidentals	$ 3,750.00
Specialized Tooling and Equipment	$ 7,500.00
Spare parts	$ 2,500.00
Consumables (gear oil, grease, etc)	$ 3,350.00
Equipment Fuel	$ 2,500.00
Contingency	$ 8,080.00
Site maint and support - 2 yr	$ 50,125.00
Total Project Budget Estimate	**$ 454,705.00**

Exhibit D: USDA Grant Proposal

Nikolski Wind Power Integration Project

The Nikolski Wind Power Integration Project is made up of two phases.

Phase 1, Wind Turbine Generator System: Utilizing the USDA/RUS grant of $474,475, Phase 1 includes the design and installation of one 65 kilowatt wind turbine generator system and interconnection to the newly commissioned, diesel fuel based power plant in Nikolski. The addition of one refurbished and retrofitted Vestas V15 (or approved equal) wind turbine generator system to the existing power generation system in Nikolski will dramatically decrease the total consumption of diesel fuel used to produce electricity. Phase 1 also includes an evaluation on the integration of the wind turbine generator system with the existing diesel power plant, recommending modifications, if any, to the diesel controls and system operability where necessary.

Phase 2, Thermal Heating System: Pending receipt of additional funding, Phase 2 will include the design, purchase, and installation of a thermal heating system to supply heat to the community center and school, derived from excess-to-load electricity generated by the wind turbine. The Contractor will provide all thermal tanks and components necessary for the thermal system. Phase 2 will also include modifying the controls of the existing diesel plant, if necessary, to provide a fully integrated system.

APIA will Contract with TDX Power for Phase 1, including procuring or furnishing the design, materials, freight, personnel, engineering, travel and related expenses necessary to install one fully operational 65 kilowatt wind turbine generation system with a tilt-up lattice tower and associated equipment, interconnect the turbine to the diesel plant, train operators, and provide maintenance assistance for two years following the installation of the wind turbine.

TDX Power anticipates Phase 1 construction during the summer of 2007. A Vestas V15 65 kilowatt wind turbine has been selected and is in the process of being retrofitted with certain design parameters unique to Nikolski. One specific design parameter includes a tilt up tower assembly, which will eliminate the need for a large crane during construction.

Upon completion of the Phase 1 installation, TDX Power will provide training to local utility employees on the operations and maintenance for the wind turbine. TDX Power will also provide ongoing support for a period of two years to assist with parts and materials, ongoing training, and annual maintenance.

The Contract between APIA and TDX Power may be modified to include Phase 2, if funding becomes available, to include the design, purchase, and installation of the thermal heating system.

The Contract between APIA and TDX Power may also be modified, if necessary and funding becomes available, to include testing and modifications of the diesel power plant controls based on the Phase 1 evaluation.
During the design phase of the diesel plant the Alaska Energy Authority/AEA assured Umnak Power, the Nikolski IRA, APIA, and the Denali Commission that the diesel plant controls would be "wind ready". The design of these controls has yet to be tested with the integration of wind energy, so that may or may not be the case. The AEA has offered cooperation with assessment of the controls, but has provided no commitment for funding modifications if they are necessary.

The Aleutian Pribilof Islands Community Development Association has expressed interest in contributing to a fund for the thermal heating system. Umnak Power is researching a plan for selling Green Tags to contribute toward funding for the thermal system and any modifications to the diesel plant controls that may be necessary.