SCHEDULE 2

DESCRIPTION OF THE COMPLEX

1. INTRODUCTION

The Complex consists of 33 Wind Turbine Generator ("**WTG**") Units with the following design parameters:

WTG Make / Model:	[ ]
Name Plate Capacity of each WTG:	[ ]
Name-Plate Capacity of the Complex:	[ ]
Wake Losses:	[ ]
Auxiliary Consumption:	[ ]
Capacity (Net):	[ ]

2. SITE EVALUATION

2.1. Land and Topography

[ ]

Point	X (east)	Y (north)
1		
2		
3		
4		

3. WTG SYSTEM SPECIFICATIONS

3.1. Rotor

Diameter:	[ ]
Swept Area:	[ ]
Number of Blades:	[ ]
Blades Length:	[ ]
Airfoil:	[ ]
Blade Material:	[ ]
Rotor Speed:	[ ]
Aerodynamic Brake:	[ ]
Direction of Rotation:	[ ]

3.2. Blade

Type description:	[ ]
Blade length:	[ ]
Material:	[ ]
Type of rotor:	[ ]
Blade profiles:	[ ]

3.3. Hub

Type description : [ ]
Material : [ ]
Corrosion protection: [ ]

3.4. Gearbox

Type description : [ ]
Gear house material: [ ]
Ratio: [ ]
Mechanical power: [ ]
Shaft seals : [ ]

3.5. Yaw system

Type description : [ ]
Number of units : [ ]
Yaw speed : [ ]
Voltage : [ ]

3.6. Nacelle

[ ].

3.7. Tower

Material : [ ]
Corrosion protection : [ ]
Access conditions : [ ]

3.8. Generator

Type description: [ ]
Rated power: [ ]
Voltage (stator): [ ]
Frequency : [ ]
Number of poles : [ ]
Synchronous speed: [ ]
Speed at rated power: [ ]
Operation speed range: [ ]
Speed range for constant power: [ ]
Reference speed: [ ]
Max rotor slip: [ ]
Power factor: [ ]
Nominal current: [ ]
Winding connection stator: [ ]
Winding connection rotor : [ ]
Protection class (Generator): [ ]
Protection class (Slip ring-unit): [ ]
Thermal classification: [ ]

3.9. Controller

[ ]

4. COMPLEX DESCRIPTION

The Seller shall design, construct and commission outdoor switch yard which shall mainly comprise of the following:

4.1. HIGH VOLTAGE (HV) SUBSTATION (132kV)

- Power Transformers
- HV Switchyard
- 132 kV Line Termination Gantries

4.2. MEDIUM VOLTAGE (MV) SUBSTATION (22kV)

The Seller shall design, construct and commission a MV Switch Gear Room which shall mainly comprise of the following:

- [MV Substation Including control and protection
- Auxiliary Transformer
- Grounding Transformers
- Emergency Diesel Generator
- State of the art Fire detection and Suppression System
- Emergency lighting shall be provided in the MV Switchgear room. This shall be automatically activated on the failure of the AC supply. The lights shall be self-contained and provide sufficient illumination to allow the safe movement of personnel within the building and to allow operation of local control panels.]

4.3. CONTROL ROOM

The Seller shall design, construct and commission a Control Room which shall mainly comprise of the following:

- [HV Protection/ communications/ control panels, and electrical SCADA system for the Complex will be housed in the control room. There will be an access from the control room to the switchgear room.
- DCP and its distribution Panel system and batteries will be housed in separate rooms other than control room. Batteries will be housed in a separate room fitted with exhaust fan and special lights.
- The Control Room shall be adjacent to the Switchgear room and shall house HV protection and control panels etc. It shall be air conditioned, insulated and illuminated to provide a suitable environment for operations personnel.
- Emergency lighting shall be provided in the Control Room. This shall be automatically activated on the failure of the AC supply. The lights shall be self-contained and provide sufficient illumination to allow the safe movement of personnel within the building and to allow operation of local control panels.
- There shall be a provision to display on the CRT, through SCADA System, for the Complex MW, MVARh, bus-bar voltage, frequency along with Power Factor in the Control room.]

5. METERING ROOM FOR NTDC

[NTDC will provide their metering panels in the metering room constructed by the seller. The metering current transformer and voltage transformer, exclusive for NTDC, and its connections to the metering room will be provided by the Seller.]

6. WORKSHOP BUILDING

[A covered storage space for small and large electrical parts and small electrical parts will be provided.]

7. ENVIRONMENTAL STANDARDS

In accordance with the Provincial; Sindh Environmental Protection Agency standards.

8. WIND SPEED OPERATING PARAMETERS

Cut In Wind Speed: [ ]
Cut Out Wind Speed: [ ]
Survival Wind Speed: [ ]

[Earthquakes: In Pakistan the seismic criteria is based on zone 2B UBC (Uniform Building Code). The Nordex load document is based on extreme load cases from extreme wind conditions and dynamic loads, but not from earthquakes. . The maximum survival acceleration according to WTG design is [ ]. Each design load case is the combination of different extreme loads depending upon whether the WTG is in running or stalled condition or forces due to braking, extreme wind and earthquake loads. The forces and moments due to earthquake are much smaller than extreme wind load.]

9. MV COLLECTION SYSTEM

The Seller shall design, construct and commission MV Collection System which shall mainly comprise of the following:

9.1. [WTG Transformer (Generator Step up Transformer- GSU)

The WTG Transformer shall be oil immersed, naturally cooled, double wound, core type in conservator design, suitable for outdoor installation. Transformer routine tests shall be carried out as per IEC60076.

- LV Winding:

These shall be made from copper foil insulated with paper with class A interlayer insulation. The LV connections shall be made from above onto LV Bushing located at the top of the tank on the opposite side to the MV connections.

- MV Winding:

These shall be independent of the LV windings and shall be made of copper wire or foil with class A insulation. The MV connections shall be made from above on the top of the tank.

- Accessories:

The following accessories shall be provided with the transformer for protection against internal faults.

- Oil temperature Indicator with contacts
- Double Float Buchholz Relay
- Pressure Relief Device with contacts
- Oil Level Gauge (Glass Tube)
- Silica Gel Breather
- Magnetic Oil Level Indicator with contacts

9.2. Ring Main Unit (RMU)

The RMU shall meet the criteria for compact, metal-enclosed indoor switchgear with circuit breakers/dis-connectors in accordance with IEC 60298.

The circuit breakers shall be of the maintenance-free. The position of the power and earthing contacts shall be clearly visible on the front of the switchboard.]

10. MV CABLING NETWORK

[Seller will ensure that all cables, materials, design, manufacture and test procedures are in accordance with the applicable IEC Standards and NTDC Standards.

The extent of works shall comprise proper cable sizing, cable routing from the RMU of the WTGs to the HV/MV Substation, laying and termination of underground, fiber optic and communication cables, including related civil works.

The power from each WTG will transformed to the MV via GSU transformers at each WTG RMU. The WTGs output at each RMU shall be interconnected with one another by underground power cables and fed into a HV/MV substation at the site.

The cabling network shall comprise of the following:

- Medium-voltage XLPE (cross- linked polyethylene) armoured 3 core metallic cables (Al) suitable for laying in ground for interconnection between WTGs, RMUs and MV switchgear room at the substation.
- The sizing of MV cabling shall accommodate 0.9 p.u. voltage and 0.95 leading to 0.95 lagging power factor condition at the substation bus and Site specific thermal resistivity. The minimum soil temperature at the cable depth shall not be less than 35ºC. All cable shall be laid as per prudent engineering practices.]

11. HV/MV SUBSTATION

[Wind farm would be connected to Purchaser’s 132 kV Grid at this HV substation. The boundary of responsibility between the Purchaser & the Seller will be at the top of the terminal gantries of the Complex substation.

The Substation Works shall conform to all the relevant requirements of the NEPRA approved NTDC Grid Code & EPA. This document provides in summary the critical requirements as under:

- The Substation shall have an HV of 132kV and provide transformation from an MV of 22kV.
- The Protection & Control systems must interface harmoniously with the NTDC systems.
- All HV substation equipment shall be according to NTDC specifications.

- The Substation and Plant must have a design life of to match the term of the project in an environment which is classified as site conditions.]

[The Work shall include the following equipment and systems.

- Two 132/22kV, 31.5/40/50 MVA Power Transformers
- HV Switch Gear 132 kV has following bays (SLD attached as Annex- 2.1):

  i. Two bays for OHTL

  ii. Two bays for power transformers

  iii. One bay for Bus sectionalizer

  They comprise of following:

  - 132kV circuit breakers
  - Dis-connectors / Isolators
  - Earthing Isolators
  - Voltage transformers
  - Current transformers
  - 132 kV Surge arrestors
  - 132 kV Coupling Capacitor Voltage transformers
  - Protection systems with relays
- MV Switch Gear 22 kV comprises of the following:

  i. Four bays for collection system

  ii. Two bays for power transformer

  iii. One bays for auxiliary transformer

  iv. One bay Spare for Collection system

  v. One Bay for Bus Section

  vi. Provision of 2 bays for reactive power shunt compensation system, if required

  vii. Two bays for Grounding Transformers
- Auxiliary transformer
- Emergency Diesel Generator]

12. CONTROL BUILDING

- AC supply system
- DC supply system
- SCADA system for Complex
- DPLC system for communication and SCADA System
- VSAT equipment
- Protection and Control system

- Event logger system

13. EQUIPMENT DETAILS

13.1. Two 31.5/40/50 MVA, 132/22 kV Power Transformers

The Power Transformers (Yn0d11- Star on 132kV Side and Solidly Grounded) shall be oil immersed, naturally cooled, double wound, core type in conservator design, suitable for outdoor installation rated at 31.5/40/50MVA,132/22 kV according to NTDC design. Transformer tests shall be carried out as per IEC60076.

13.2. 132kV Circuit Breaker

The Circuit Breaker shall be according to NTDC's specification and with IEC 62271-100, 3 pole, 145kV rated, 2000A, 40kA 1 sec, 50Hz, duplicate 110V DC trip coils, 110V DC or 230V AC electric motor with spring operating mechanism.

13.3. 132kV Dis-connectors / Isolators

Dis-connectors / Isolator shall be in accordance with NTDC specifications, manually or motor operated, three poles, 145kV rated, 2000A, 40kA, 1 sec, 50Hz.

13.4. 132 kV Dis-connector with Earthing Switches (Line Isolators)

Dis-connectors / Isolator with earthing switch shall be in accordance with NTDC specifications, manually or motor operated, three poles, 145kV rated, 2000A, 40kA, 1 sec, 50Hz.

13.5. 132kV Outdoor Surge Arresters

Surge Arresters shall be as per NTDC standards.

13.6. 132kV Voltage Transformers

Voltage Transformers shall be as per NTDC standards.

13.7. 132kV Outdoor Coupling Capacitor Voltage Transformer

Voltage Transformers shall be as per NTDC standards.

13.8. 132kV Current Transformer

Current Transformers shall be as per NTDC standards.

13.9. MV Switch Gear

The 22kV System should be applicable with IEC standards, & standard protection relays, suitable for operation according to site conditions.

13.10. Remote indications for NPCC

The tentative remote indications are as under:

- Earthing switch ON

- Earthing switch OFF
- Circuit breaker ON
- Circuit breaker OFF
- Circuit breaker tripped through fault
- Miniature circuit breaker tripped (as a group signal)
- No control voltage (as a group signal)
- Protection activated (as a group signal)
- No busbar voltage
- Voltage transformer MCB tripped (as a group signal)
- Trip coil/trip circuit fault (as a group signal)
- Low gas pressure (SF6)
- Positive / Negative ground fault detection indication.

The I/O List shall be finalized at design stage.

13.11. **Protection System**

Seller shall provide a suitable protection system to cope with the faults contributed by the wind farm, substation and the grid for safe operation as per requirement of NTDC.

13.12. **DC Supplies**

- The provision of dual 110V DC supply system including two battery banks and two battery chargers for control and protection system with auto / manual change over system shall be made available in accordance with NTDC Standards with 400V three phase input.

- Provision of single 48 V DC supply system including one battery bank and two battery chargers (one main and one back-up) for telecom system shall also be made available in accordance with NTDC Standards.

13.13. **UPS**

A UPS for the wind farm SCADA system at the substation and the control building compound for a minimum of 2 hours back-up shall also be provided.

13.14. **Auxiliary Transformer and Main Distribution Board**

One 22kV / 400V, 300 kVA auxiliary transformer with change over arrangement shall be provided. The Auxiliary transformer shall be connected to the main 22kV busbar via breaker and supply the Main distribution Board at 400V with circuit breakers. The transformer shall be, three phase, delta-star connected with impedance value of around 5%. The Main Distribution board shall supply the substation 400/230V power requirements. The Main Distribution board shall be supplied with provision of manual / Auto switchover to an emergency diesel generator of 300 kVA if the auxiliary transformer is de-energized.

14. GROUNDING SYSTEM

The earth system shall be designed in accordance with applicable IEC or NTDC Standards and shall ensure safe step and touch potentials in the event of a fault or lightning strike.

The Wind Farm's earthing system shall be an interconnected network of bare copper stranded conductor, flat strip and copper-clad earth rods. The system shall be provided to protect plant personnel and equipment from the hazards, which can occur during power system faults and lightning strikes.

The WTG earthing grid shall be adequately designed for high earth fault current concentration areas. Grid spacing shall be sufficient for maintaining safe voltage gradients.

A terminal bar for Equipment earthing shall be provided and secured inside each enclosure for the attachment of the earth conductor and all the internal/external earth conductors.

The terminal bar shall be bonded to the cabinet and to all non current conducting parts.

Bonding shall be provided where necessary to assure electrical continuity and the capacity to conduct safely any fault current likely to be imposed. A bonding jumper shall be a wire, bus, screw or similar suitable conductor.

Any non-conductive paint, enamel or similar coating shall be removed at contact points in order to assure effective contact to earth.

All metal parts shall be bonded to earth using a stranded copper conductor of minimum size of 25 mm^2.

15. LIGHTNING PROTECTION

The earthing system at each WTG location, control building and substation shall be interconnected by directly buried suitable stranded copper conductors terminated on appropriate earth bars which can be easily accessed for inspection.

For lightning protection of turbines, a connection shall be made to the earthing system at the base of each WTG. The neutral point of the low voltage side of transformers is directly grounded.

A main equalizer, connected to all wind turbine grounding systems, neutrals on low voltage side of transformers and grounding system at the control building is to be laid as a 95mm^2 bare copper wire in all cable trenches. All WTGs shall be interconnected with the 95 mm^2 bare stranded copper wire and including up to the substation. However, the conductor shall be segregated or insulated between circuits to enable progressive commissioning of the 22kV feeders without inducing dangerous voltages.

The materials used shall be compatible with the existing environmental conditions. Proprietary connectors, designed for the specific use (size and type of conductors, buried or otherwise) shall be used at all connections points and adequate to carry prospective fault currents and protected against corrosion for term of the project. The resistance shall be measured and confirmed before commissioning by means of reduced voltage injection method.

Adequate number and sizes of earthing rods shall be driven into the ground and connected to a ring around the WTGs to ensure that safe step and touch potential are maintained during fault conditions on the electrical system in accordance with appropriate earthing standards.

The ring shall be connected to the tower and earthing arrangements inside the tower on dedicated brackets via minimum two copper wires with tin-coated copper cable terminals with a hole diameter of 12 mm. The connection shall be with a good electrical connection (pure metallic connection where the paint has been removed and the connections are to be protected against corrosion).

The minimum requirement for the WTG earthing is as follows:

- The earthing system at the turbines shall be made as 95mm² bare copper wire laid around the turbine foundations with a distance of 1 meter and with a depth of 1 meter below surface.
- Two 3m long, 16 mm diameter copper earthing rods connected to the ring and shall be located opposite each other (180 deg.).
- In addition to the cable screens, 95 mm^2 Interconnecting Earthing Conductor including terminations between each WTG and Control building shall be provided. The overall grounding resistance shall not be more than 5 Ohms.

16. COMMUNICATION SYSTEM

This will be Complex communication set-up:

[ ]

17. Power Line Carrier (PLC)

To facilitate remote monitoring for NTDC of the Wind Farm, Seller shall establish the monitoring of I/O functions detailed below to input into the system.

PLC shall be the main medium of communication between Complex and NTDC/NPCC while back-up medium shall be satellite communication through VSAT between Complex and NPCC Islamabad for voice, fax and data communication (to be provided by Seller).

Four (04) numbers of same make & type of Digital PLC (DPLC) equipment along with outdoor coupling equipment shall be procured by Seller. Two of these DPLC along with outdoor coupling equipment shall be installed at Complex and the other two at Purchaser's ends (Nooriabad and Jhampir). The cost of DPLC equipment installed at Purchaser's ends shall be reimbursed to Seller by Purchaser.

18. Digital Signals

Digital signals are to be provided in the form of potential free 'normally open' contacts.

- Open and Closed Status of 132 kV Line and Bus section CB's.
- Open and Closed Status of 132 kV Line and Bus section Isolators.
- Open and Closed Status of 132 kV Line and Bus section Earth Switch.
- Status of Wind Farm 132 kV Line Differential Relay tripped.
- Status of Wind Farm 132 kV Line Distance Relay tripped.
- Status of Wind Farm 132 kV Line and Bus section Over current Relay tripped.
- Status of Wind Farm 132 kV Line and Bus section Auto Re-close Lockout Condition.
- Status of Wind Farm 132 kV Line and Bus section CB SF6 Gas Low Alarm.

- Status of Wind Farm 132 kV Line and Bus section CB ‘Not Healthy’ Alarm.
- Status of Wind Farm 132/22kV Transformer Differential/Over current Relay Failure Output.

19. Analogue Signals

Note the format for analogue signals are shown after each function.

- Three Phase 132 kV Volts
- Three Phase 132 kV Amps
- 132 kV Watts, to/from wind farm from/to grid.
- 132 kV VARS, to/from wind farm from/to grid
- 132kV bus Frequency

20. SCADA Signals

20.1. LINE DISTANCE PROTECTION

i. Distance Protection Tripped
ii. Zone-1 Operated
iii. Power Swing Blocked operated
iv. SOTF operated
v. Protection Unhealthy

20.2. LINE DIFFERENTIAL PROTECTION

i. Differential / Distance Protection Tripped
ii. Phase A operated
iii. Phase B operated
iv. Phase C operated
v. Protection Unhealthy

20.3. OVER CURRENT AND EARTH FAULT PROTECTION

i. O/C and E/F Protection Tripped

20.4. 132kV Switchyard Bay (Generator Transformer Bay)

i. Transformer Differential Protection Tripped
ii. Transformer Differential Protection Healthy
iii. Over Current and Earth Fault Protection Trip
iv. Buchholz Protection Trip
v. Winding Temperature Tripped
vi. Pressure Relief Value Tripped
vii. REF Tripped
viii. Lockout Operated

20.5. BUSBAR PROTECTION

i. Bus Bar Differential Protection Operated
ii. Bus Bar Protection unhealthy

20.6. **BREAKER FAILURE PROTECTION FOR EACH BREAKER**

i. Stage-I tripped
ii. Stage-II lockout / tripped
iii. Breaker fail inter trip transmitted (for line bays)
iv. Breaker fail inter trip received (for line bays)
v. Breaker fail inter trip channel fail (for line bays)

20.7. **AUTO RECLOSURE**

i. Auto reclosure blocked
ii. Auto reclosure successful

20.8. **PLC / TELECOM Alarms**

i. Communication failure alarm (each PLC)
ii. 48V DC supply failure alarm
iii. 110 V DC supply failure alarm
iv. Charger failure alarms

21. Purchaser's Monitoring System Requirements

Seller shall provide an interface between both the Seller's and Purchaser's monitoring systems via SCADA system. The following indication shall be provided:

- Power factor/voltage and maximum output for the whole Complex
- Analogue data: voltage, amps, MW and MVAR at the 132kV Line.
- Status of the 132kV Line and bus section circuit breakers, isolators, earth switches.
- Wind data from Anemometry System

22. WTG TOWER FOUNDATIONS

WTG Foundation shall be spread foundation of RCC concrete. The foundation design and construction shall confirm to all applicable civil engineering codes in Pakistan.

23. PROTECTION RELAY AND ANNUNCIATION SYSTEM

Seller's Grid-station shall be equipped with protection Relays & Control Panels with Annunciation System as per NTDC specifications.

24. SCADA (INTEGRITY SYSTEM CHECKS, DATA PROCESSING, DATA PARAMETERS)

The wind farm is remotely monitored and controlled (at site) through a SCADA system of Mita-Teknik. This system is called GATEWAY and can be used for online operation monitoring, processing of user-defined reports and statistics as well as remote monitoring of Nordex S77 Wind Turbines. Following data parameters can be monitored by End User:

i. Power Curve

This module is used for reading power data and displaying it in the form of a diagram or table. The wind data used for the representation of the power curve is measured on the nacelle behind the rotor.

ii. 24h / 10m Log

The data available in the 24h/10m log are 10 analogue data stored as average values of 10 minutes over the latest 24 hours. In the menu of the controller it can be configured which 10 values should be available for presentation.

iii. Production Overview Log

The Production Overview Log provides you with information on energy produced by a wind turbine during certain period.

iv. Availability Log

The Availability Log allows having information on amount of time a wind turbine has been available for production during certain period. It is measured in percents and equals to the ratio between amount of time a wind turbine produced energy and a total amount of time.

v. Wind Rose Log

The Wind Rose Log is in general a collection of wind frequency and speed in different wind sectors. It determines how often the wind is blowing from particular direction, i.e. wind sectors, and what its speed is. Using the wind rose it is possible to deduce the optimal direction for a wind turbine.

vi. Plant Overview

The Plant Overview screen gives you a current data list view over all WTGs in a plant. Each WTG is presented with its name, Wind speed, Wind direction, Rotor RPM, Generator RPM, Production kW, Date-time, System status. The state of each WTG will be shown with an icon (OK, Error, Warning and status unknown).

vii. Weather Station Data

The weather station panel (for anemometry system), shows weather conditions on the outside of the turbine. The wind speed on different height and its direction, as well as air temperature, pressure, density and humidity are shown there.

The seller shall be responsible to arrange all the equipment and material brand new from the international reputable manufacturer in compliance to the relevant IEC, ISO and NTDC Codes.

SCHEDULE 3

SELLER AND PURCHASER INTERCONNECTION FACILITIES; INTERCONNECTION POINT

1. **Seller Interconnection Facilities (Design Data)**

   1.1. Protective Devices:
   Seller interconnection facility shall be equipped with required protective devices as per prudent engineering practices. Protective relays, duly approved by the Power Purchaser, shall be in accordance with applicable IEC & NTDC standards.

   1.2. Power Factor:
   The power factor for the WTGs is [ ] leading and [ ] lagging. At point of interconnection with the grid at 132 kV level the power factor will be maintained at [ ] lagging/leading.

2. **Interconnection and Transmission Facilities**

   2.1. The connection between the Complex substation and the Purchaser’s Grid station shall be through a double circuit in/out arrangement of Jhamphir- Nooriabad existing single circuit 132 kV Line to be constructed by Power Purchaser. The transmission lines will terminate in the substation of the Complex, the location of which is shown on the attached Site plans. The circuits of the transmission lines will connect at gantries of the Complex substation provided by the Seller as shown on the attached substation layout drawing. The boundary of the responsibility between the Seller and the Purchaser will be at the top of the gantries of the Complex substation (the “**Interconnection Point**”). The Seller will provide the Purchaser with an earth connection from the earthing system of the Complex substation. The Purchaser will provide the Metering System which together with the transmission line(s) referred to above within the Site boundary shall comprise the “Interconnection Facilities.” This equipment will be the property of the Purchaser and shall be commissioned, operated and maintained by the Purchaser.

   2.2. Protection:
   Tele-protection scheme at Complex substation owned by Seller and substations owned by the Purchaser will be in accordance with NTDC Standards and as follows;

      i. Between Complex and Purchaser’s Grid at Nooriabad through Digital PLC Link

      ii. Between Complex and Purchaser’s Grid at Jhampir through OPGW (Optical Ground Wire) or ADSS (All Dielectric Self Supporting Fiber Optic)

   Differential Protection Relay(s) should have provision for direct connection with fibers of OPGW / ADSS cable.

3. **Design Data**

The Seller will provide before financial closing the Purchaser with the following Design Data to enable completion of the design of the Interconnection Facilities and the Transmission Facilities by the Purchaser:

3.1. Generator Design Data

i. Rating

Nominal Rated Capacity: [ ]
Power factor: [ ]
Number of phases: [ ]
Number of poles: [ ]
Frequency: [ ]
Rated speed: [ ]
Terminal voltage: [ ]
Short circuit ratio at rated MVA: N/A [not< 0.6]
Cooling system: [ ]

ii. Generator Parameters

a. Asynchronous data:

Rated voltage	Un		V
Winding connection	[S=1,D=2]		
Rated current	In		A
Rated impedance	Zn		Ω
Rated frequency	Fn		Hz
Magnetizing reactance	Xh		Ω
Stator resistance	R1		Ω
Rotor resistance	R'2 [operation]		Ω
Stator leakage reactance	X1S [operation]		Ω
Rotor leakage reactance	X'2S[operation]		Ω
Rotor resistance	R'2 [Start]		Ω
Stator leakage reactance	X1S [Start]		Ω
Rotor leakage reactance	X'2S[Start]		Ω
Stator reactance	X1		Ω
Rotor reactance	X'2		Ω
Leakage coefficient	σ		

b. Synchronous data:

Magnetizing reactance	xh		%	1.080	Ω
Stator resistance	r1		%	0.003	Ω
Rotor resistance	r'2		%	0.005	Ω
Stator leakage reactance	x1s		%	0.020	Ω
Rotor leakage reactance	x'2s		%	0.028	Ω
Stator reactance	x1		%	1.100	Ω
Rotor reactance	x'2		%	1.108	Ω

Magnetizing reactance	xhd		%	1.080	Ω
Magnetizing reactance	xhq		%	1.080	Ω
Direct-axis synchronous reactance	xd		%	1.100	Ω
Transient synchronous reactance	x'd		%	0.047	Ω
Subtransient synchronous reactance	x"d		%	0.047	Ω
Quadrature-axis synchronous reactance	xq		%	1.100	Ω
Transient synchronous reactance	x'q		%	0.047	Ω
Subtransient synchronous reactance	x"q		%	0.047	Ω
Open-circuit time constant	T'd0		S		
Direct-axis transient open-circuit time constant	T'd		S		
Direct-axis subtransient open-circuit time	T"d		S		
Quadrature-axis transient open-circuit time	T'q		S		
Quadrature-axis subtransient open-circuit time	T"q		S		
DC-declay time constant	Ta		S		

c. Inertia constant
Generator : [ ]

d. Generator Losses and Efficiencies
Efficiency: At full load = [ ]%
Losses: At full load: [ ] kW

3.2. Wind Generator Power Curves. (Attached as Annex-3.1)

3.3. Generator Step-Up Transformers (GSU)
Rating: [ ]
Rated voltage: [ ]
Maximum and minimum operating voltages: [ ]
Connection of winding: [ ]
Off Load Tap Changer
Taps of Winding: [ ]
Positive and zero sequence reactances
(% on rated kV & MVA base): [ ]

3.4. Substation

i. Power Transformers:
Type: [ ]
Design Standard: [ ]
Primary voltage: [ ]
Secondary voltage: [ ]
Vector Group: [ ]
Impedance: [ ]
Rating: [ ]

Cooling: [ ]
Rated insulation winding level: [ ]
[ ]
Type of Cooling Liquid: [ ]
At Max. Ambient Temperature: [ ]
Temperature Rise of Top Oil: [ ]
Temperature Rise of Winding: [ ]
System Highest Voltage HV: [ ]kV
Power Freq. Withstand Volt. HV: [ ]kV
Rating Impulse Voltage HV: [ ]v
Insulation Class: [ ]
Conductor Material HV & LV: [ ]
Application Standard: [ ]

ii. Circuit Breakers
Rated voltage: [ ]kV
Rated normal current: [ ]
Rated Symmetrical breaking current: [ ]
Rated out of phase breaking current: [ ]kA
Rated short-circuit making current: [ ]kA
Rated duration of short circuit: [ ]sec
Rated Operating sequence: [ ]
Total interruption time: [ ]cycles

iii. Current Transformers
Rated voltage: [ ]kV
Rated normal primary current:

- 1600:800:400 A (Line CTs)
- 1200:600:300 A (NTDC Metering CTs)

Rated secondary current: [ ] A
Accuracy Class for measuring core: [ ]
Continuous thermal rating: [ ]
Short time current rating: [ ]kA
Maximum Thermal burden: [ ]VA (for NTDC Metering CTs)
Impulse withstand voltage: [ ]kV peak
Power frequency withstand voltage of primary winding: [ ]kV
Power frequency withstand voltage of secondary winding: [ ]kV

iv. Voltage Transformers

Rated primary voltage phase to neutral: [ ]kV
Rated secondary voltage phase to neutral: [ ]kV
Rated Secondary output for measuring core: [ ]VA
Accuracy Class for measuring core: [ ]
Impulse withstand voltage: [ ]kV peak
Power frequency withstand voltage of primary winding: [ ]kV
Power frequency withstand voltage of secondary winding: [ ]kV

4. **Seller Interconnection Works:**
   As per details provided in Schedule 2

5. **Purchaser Interconnection Facilities (Design Data):**
   To be provided by NTDC

SCHEDULE 4

FORM OF CONSTRUCTION REPORTS; PROJECT PROGRESS REPORTING

Monthly progress reports shall be prepared consistent with the following general format and delivered to the Purchaser in accordance with the requirements of the Energy Purchase Agreement.

1. **Narrative**

1.1 Information

i. Project Information including Project Name, Location, Project Company, Capacity, Expected COD etc.
ii. Delays if any
iii. Issues if any
iv. Any other information

1.2 Engineering

1.3 Civil / Structural

i. Mechanical
ii. Electrical/Control
iii. Substation

(For each item above, identify when started, if continuing and when completed).

1.4 Construction

i. Civil / Building
ii. Electrical/control
iii. Grid connection / substation
iv. Production of WTG Components
v. Transport of WTG components
vi. Erection & commissioning of WTG components
vii. HSE
viii. QA/QC
ix. Site Services

(for each item above, identify when started, if continuing and when completed.)

2. Schedules

i. Monthly Completion vs. Targeted:
ii. Project Schedule Update:
iii. Engineering:
iv. Construction:
v. Start-Up:

3. Consents

Consents Applied for:
Consents Received:
Consents Outstanding:

SCHEDULE 5

TECHNICAL LIMITS and MINIMUM FUNCTIONAL REQUIREMENTS

1. TECHNICAL LIMITS

1.1. Design Limits

1.1.1. Wind Turbine Operating Limits (at Hub Level)

i. Cut-In Wind Speed: [ ]m/s at 10 minutes average
ii. Cut Out Wind Speed: [ ] m/s at 10 minutes average
iii. Survival Wind Speed: [ ] m/s at 10 minutes average
iv. Output at wind speeds: As per WTG power curve
v. Temperature Range: - [ ] ^{O}C to [ ] ^{O}C (Re-Cut In at [ ] ^{O}C)

1.1.2. Start-up of the Complex

WTGs will start whenever the ambient temperature and wind speed is within above mentioned range and provided Grid is available for excitation.

1.1.3. Complex Loading

i. The WTG loading will follow the attached complex power curve at varying wind speeds.

ii. The Complex can withstand a full load rejection and remain in a safe condition (maximum 20 times per year). Following Grid availability, the Complex will be subject to a full start up sequence. Restart time will be wind speed dependant.

1.1.4. Power Factor, Voltage and Frequency Limits

i. The Complex can operate with power factor in the range [ ]lagging/leading at Interconnection Point which range shall not be exceeded.

ii. The Complex can operate within the range ± [ ]% on the 132 kV high voltage system which range shall not be exceeded.

iii. The Complex can operate within the frequency range 48.5 Hertz to 51.5 Hertz which range shall not be exceeded.

iv. The Complex will be subject to tripping if voltage and/or frequency fluctuations outside the ranges stated in 1.1.4 (ii) and (iii) occur.

1.1.5. General

The Seller shall advise the Purchaser of any temporary operating constraints and limits which may from time to time apply to the Complex.

1.2. Design Maintenance Limits

1.2.1. The cycle of Schedule Outages is set out in Table 1 below together with manufacturer's recommended durations for such inspections.

TABLE 1

[ ]

1.2.2. In order to achieve the optimum performance of the Wind Farm in accordance with prevailing site conditions, fine-tuning of Wind Turbines and their control software is required during first few months of commissioning / operation (normally three months). Therefore during this period the turbines require more maintenance outages thus reducing the availability up to 85 %.

2. MINIMUM FUNCTIONAL REQUIREMENT

2.1. General:

The Complex shall be of proven design, new, unused, latest model, build to appropriate internationally recognized standards, and shall comply with all the applicable codes and regulations. It shall be capable of operating in parallel with the other generators connected within the Grid System / Distribution System and achieve the levels of availability and reliability normally expected of a modern power plant of the same technology. The Complex shall be capable of operating within the temperature range of – [ ]ºC to + [ ]ºC.

2.2. Wind Turbine Generators:

Wind Turbine Generators shall be designed and manufactured in accordance with the IEC and / or equivalent International Standards. They shall have variable speed control and independent blade pitch system. The variable speed control shall continually adjust the rotor rpm level for optimum thrust at each wind speed. The tubular steel towers shall consist of sections and have hub-height 80 meters. Towers shall be equipped with service platforms. Each tower section shall have interior ladder. The Wind Turbine Generator Units shall be appropriately sited in order to capture the maximum amount of the energy from the Wind in the area.

The Wind Turbine Generator units would be started, synchronized, loaded and shutdown fully automatically from the control desk in the central control room of the Complex with all operational commands and status being logged in the Complex Monitoring System. Automatic Cut In Wind Speed and Cut Out Wind Speed sequence based on the prevalent wind speed will include starting the Wind Turbine and starting of all auxiliary drives or connections required for proper functioning of the system.

Generators shall be rated to match the maximum output of the wind turbine and shall be designed and manufactured in accordance with the IEC and / or equivalent International standards. Winding insulation shall be non-hydroscopic and of class F. The generators shall be capable of supplying rated output within ±[ ]% of rated frequency i.e. 50 Hz and ±10% of nominal rated voltage within the power factor range of [ ] lagging/leading. (measured at the high-voltage busbar of the substation).

2.3. GSU Transformer:

A GSU Transformer for each wind turbine generator together with protection, and circuit breakers as required, shall be provided.

Transformers shall be rated to the full continuous output of the generator within the range of local ambient temperatures and equipped with off-load tap changer. The secondary voltage shall be [ ] kV. They shall be capable of operation at +/- [ ]% of the rated voltage.

2.4. Substation:

A complete substation with new and un-used equipment and materials shall be constructed at suitable location to facilitate cost-effective transmission of power to the Grid System. It shall comprise 132 kV switchgear with adequate number of line bays for interconnecting Purchaser's Grid System for complete dispersal of the plant output under normal and single contingency conditions. Through a properly designed collector system, the energy generated by each Wind Turbine Generator unit will be taken to the Substation and transformed to the high voltage conforming to that of the Grid System intended to be connected with. The power transformers shall be equipped with on-load tap changers. It shall be ensured that the power is delivered at standard, consistent voltage and frequency levels. All the substation equipment shall be capable of operation within the range between ±10% of the rated voltage under normal conditions.

2.5. Reactive Power Compensation:

The Complex shall be equipped with Reactive Power Compensation System, if required, to avoid any adverse effect on the Purchaser's Grid System. Complex will operate at +/- [ ] Power Factor at the point of interconnection.

2.6. Control, Protection and Supervision:

A control and monitoring system shall be provided for monitoring operation of the Complex and providing telecommunication and tele-metering to the Control Room. A complete and comprehensive protection system for the Complex and inter-tripping provisions between Seller's substation and the connected Grid Station shall be provided by the Seller.

2.7. Metering System:

Metering System on the high voltage side of the Power Transformer(s) at the substation shall be provided by the Purchaser for export and import metering. Independent current transformers of accuracy class [ ] s and voltage transformers of accuracy class [ ] shall be provided at the Substation by the Seller for providing input to the Energy Meters. The Metering System shall have an overall measuring error within ±[ ] %. A separate air-conditioned room in the Complex's Substation shall be provided. All cabling between the Meters and associated Current Transformers and Voltage Transformers shall be laid as per prudent engineering practices.

2.8. Anemometry System Functional Requirements

Anemometry System shall be in accordance with Schedule 10. It should be capable to measure and record the Wind Speed, Wind Direction, Ambient Temperature, humidity at site using suitable equipment. The equipments are calibrated in accordance with applicable standards.

2.9. Complex Monitoring System Functional Requirements

All functions of the wind turbine are monitored and controlled by a microprocessor-based control system operating with a multi-processor architecture. This is connected via optical fibers to a host of sensors.

Grid voltage, frequency and phasing, rotor and generator speed, diverse temperatures, oil pressure, cable twist as well as the meteorological conditions are monitored.

2.10. Environmental Requirements:

The Complex shall comply with the environmental requirements of the Sindh Environmental Protection Agency (SEPA). It shall be particularly ensured that the noise generated by the Wind Turbine Generator System is within the limits of the state-of-the-art technology.

2.11. Harmonics:

At present there is no issue of the feeding of harmonics from the Complex or the grid system of Purchaser. It is, however, mutually agreed that if an eventuality comes at a later stage when the harmonics impact the operation of the Wind Farm, the issue will be deliberated and resolved with mutual consent by the Seller & Purchaser.

SCHEDULE 6

METERING

1. Provision of Metering

The metering points to record the MWh and MVARh exchange between the Complex and the Purchaser's Grid System shall be at the HV Side (132kV) of the Power Transformer of the Complex. An exclusive set of current and voltage transformers (0.2s & 0.2 accuracy class respectively) to feed the current and voltage to the metering system shall be provided by the Seller. The meters owned by the Purchaser will be located within the substation in a separate room as detailed in Schedule 3. The Purchaser shall procure the Metering System with accuracy class of 0.2 and the Seller shall install the Metering System along with its own metering system with an accuracy class of 0.2 to act as back-up of the Metering System to be referred as "Back-up Metering System" thereafter.

The Metering System shall be according to the specifications as defined by NTDC.

2. Testing

2.1 The calibration of meters will be checked to ensure that the accuracy remains within the specified limits. The method of calibration and frequency of tests will be agreed between the Seller and the Purchaser based on knowledge of the performance and the design of the installed meters and the manufacturer's recommendations.

2.2 Compensation will be made for the errors of current and voltage transformers in the meter calibration or during computation of records. Current and voltage transformers will be tested for ratio and phase angle errors following manufacture at an accredited testing station in the presence of representatives from the Seller and the Purchaser. Test certificates issued by the testing station will be issued independently to both Parties.

2.3 Testing and calibration of the Metering System shall be carried out by the Purchaser after giving appropriate notice to the Seller in line with the agreed frequency of testing or in the event of either Party having reasonable cause to believe the meters are outside specified limits. During such tests and calibration the Seller shall have the right to have a representative present at all times.

3. Anemometry System

The Seller shall be responsible for the testing and calibration of the anemometers installed in the Complex in accordance with the Operating Procedures established under Section 5.10. On the completion of such tests/calibrations, the Seller shall provide the Purchaser with all the certificates of the tests/calibrations performed, which shall be endorsed by the Engineer.

SCHEDULE 7

COMMISSIONING AND RELIABILITY RUN TESTS

1. Complex Reliability Run Test

1.1. A reliability run test of the Complex will be carried out as part of the Commissioning tests and must be satisfied prior to the Complex being certified as "Commissioned" by the Engineer.

1.2. This test is to run the Complex continuously at maximum possible load, as per prevailing wind speed, for a period of seven (07) days (168 hours).

1.3. The purpose is to confirm that all individual equipment can operate continuously, within its Technical Limits, without exceeding any of its safe limits without being damaged.

1.4. The test shall have been satisfactorily completed only if it continues, without any interruption, for not less than 168 hours with 85% minimum availability.

1.5. Any interruption due to wind speed being out of the range from Cut-in to Cut-out speeds, ambient conditions and Grid Behavior outside Technical Limits will be ignored.

1.6. If a turbine goes "off line" due to low or high wind speeds, grid faults and ambient conditions being outside Technical Limits this time is included in the reliability period since the unit is "off line", but available for operation.

1.7. The 07 days (168 hrs) reliability test of the Complex shall be considered completed upon the successful commissioning of the last wind turbine.

1.8. Upon successful completion of Complex Reliability Run Test, a certificate for Complex Commissioning will be issued by the "Engineer".

SCHEDULE 8
INSURANCE

PART I: CONSTRUCTION PERIOD

1. Marine and Air Cargo

<u>Cover:</u> All materials, equipment, machinery, spares and other items for incorporation in the Complex against all risks of physical loss or damage while in transit by sea or air from country of origin anywhere in the world to the Site in Pakistan, from the time of the insured items leaving warehouse or factory for shipment to the Site. Cover to institute Cargo Clauses (Air), institute War Clauses (Air), (Sendings By Post), institute Strikes Clause (Cargo, Air Cargo) or equivalent.

<u>Sum insured:</u> An amount equal to cost and freight of any shipment

<u>Deductible:</u> Not to exceed US$ 100,000 each loss.

<u>Insured:</u> The Seller, the Contractors and suppliers to the Seller and to the Contractors.

2. Loss of Revenue Profits (following Marine incident)

<u>Cover:</u> Against loss of revenue following delay in start of Commercial Operation as a direct result or physical loss or damage to the materials, equipment, machinery and other items in transit by sea or air to the Site, to the extent covered under the Marine Cargo insurance.

<u>Sum insured:</u> An amount equal to the estimated continuing expenses, including debt servicing during the indemnity period.

<u>Indemnity Period:</u> Not less than 12 Months.

<u>Deductible:</u> Not to exceed 60 Days.

<u>Insured:</u> The Seller and the Lenders.

3. Contractors' All Risks

<u>Cover:</u> The contract Works executed and in the course of execution, materials and temporary works, while on the Site, against all risks of physical loss or damage <u>other than</u> war and kindred risks, nuclear risks, unexplained shortage, cost of replacing or repairing items which are defective in workmanship, material or design; penalties; consequential losses; cash; vehicles; vessels; aircraft. Cover shall provide the equivalent terms, conditions and perils/causes of loss provided under an Erection All Risks insurance policy.

Sum insured: The Contract Price.

Deductibles: In relation to Contract Works, Materials etc.

(a) arising during the Construction and Testing period:

(i)	from Storm, Tempest, Flood, Water Damage, Earthquake, Tsunami, Subsidence and Collapse	Not to exceed US$ 300,000
(ii)	from any other cause, other than in (a)(i) above	Not to exceed US$ 150,000

(b) arising out of operational testing or Commissioning:

(i)	of turbine generators	Not to exceed US$ 150,000
(ii)	of Complex other than turbine generators	Not to exceed US$ 150,000

Period of Cover: Actual construction, testing and Commissioning until expiry of the warranty period.

Insured: The Seller, the Contractors and all suppliers and consultants, GOP, Purchaser and the Lenders.

General: During the warranty period, cover shall be limited to the loss or damage for which the Construction Contractor is liable under the warranties of the Construction Contract. Cover shall include transit within Pakistan of locally procured materials. Cover shall cease, and be transferred to Operating Period insurance, on the day following the Commercial Operations Date.

4. Loss of Revenue (following C.A.R.)

Cover: Against loss of revenue following delay in start of Commercial Operation as a direct result of physical loss of or damage to the Works during construction or operational testing to the extent that such loss or damage is covered under the Contractors' All Risks policy.

Sum insured: An amount equal to the estimated continuing expenses, including debt servicing during the indemnity period.

Indemnity Period: Not less than 12 Months.

Insured: The Seller and Lenders.

Deductible: Not to exceed 60 Days.

Period of Cover: Actual Construction, testing and Commissioning periods of the Project from mobilization of the Contractors until the day following Commercial Operations Date.

5. Public Liability

Cover: Against legal liability to third parties for bodily injury or damage to property arising out of the construction, testing and Commissioning of the Complex in Pakistan.

Sum insured: For any one claim:

US$ 5,000,000.

Deductible: Not to exceed US$ 50,000 for each claim for damage to property. None for injury to persons

Insured: The Seller, Lenders, Contractors, all suppliers and consultants, GOP and Purchaser.

Period of Cover: The actual construction, testing and Commissioning of the Complex from mobilization of the Contractors until the day following Commercial Operations Date.

6. Miscellaneous

Other insurance as is customary, desirable, expedient or necessary for the smooth implementation/operation of the Complex and / or to comply with local or other requirements, such as Workmen Compensation Insurance in relation to all workmen employed in the construction of the Project and Motor Insurance on any vehicle.

PART II: OPERATING PERIOD

1. All Risks Insurance - Fixed Assets

Cover:	All building contents, machinery, stock, fixtures, fittings and all other personal property forming part of the Complex against "All Risks" of physical loss or damage, including (but not limited to) those resulting from fire, lightning, storm, tempest, flood, hurricane, water damage, riot, strikes, malicious damage including act of terrorism and sabotage, earthquake, tsunami, collapse.
Sum insured:	Full replacement value of the Complex.
Deductible:	Not to exceed US$ 250,000 each loss.
Insured:	The Seller, the O&M Contractor, GOP, Purchaser and the Lenders.

2. Consequential Loss Following All Risks

Cover:	Loss of revenue due to loss of capacity and/or loss of output as a direct consequence of loss of or damage to the Complex and caused by a peril insured under paragraph 1 above.
Sum insured:	An amount equal to the estimated continuing expenses, including debt servicing during the indemnity period.
Indemnity Period:	Not less than 12 Months.
Deductible:	Not to exceed 60 days .
Insured:	The Seller, the O&M Contractor and the Lenders.

3. Machinery Breakdown

Cover:	All machinery, Complex and ancillary equipment forming part of the Complex against sudden and unforeseen physical loss or damage resulting from mechanical and electrical breakdown or derangement, electrical short circuits, vibration, misalignment, excessive current or voltage, abnormal stresses, centrifugal forces, failure of protective or regulating devices, impact, collision and other similar causes.
Sum insured:	Full replacement value of all machinery, Complex etc.
Deductible:	Not to exceed US$ 300,000 each loss.
Insured:	The Seller, the Lenders, Purchaser and the O&M Contractor.

4. Consequential Loss following Machinery Breakdown

<u>Cover:</u> Loss of revenue due to loss of capacity and/or loss of output as a direct consequence of loss or damage to the Complex caused by a peril insured under paragraph 3 above.

<u>Sum insured:</u> An amount equal to the estimated continuing expenses, including debt servicing during the indemnity period.

<u>Indemnity Period:</u> Not less than 12 Months.

<u>Deductible:</u> Not to exceed 60 days\.

<u>Insured:</u> The Seller, the O&M Contractor and the Lenders.

5. Public Liability:

<u>Cover:</u> Legal liability of the insured for damage to property of third parties or bodily injury to third parties arising out of the ownership, operation and maintenance of the Complex.

<u>Sum insured:</u> US$ 5,000,000 for any occurrence.

<u>Deductible:</u> Not to exceed US$ 50,000 each claim for property. None for injury to persons.

<u>Insured:</u> The Seller, the O&M Contractor, the Lenders, GOP and Purchaser.

6. Miscellaneous

Other insurance as are customary, desirable, expedient or necessary for the smooth implementation/operation of the Complex and / or to comply with local or other requirements, such as Workmen Compensation Insurance in relation to all workmen employed in the Complex or in connection with its operation and Motor Insurance on any vehicle.

7. Indexing of Limits

The coverage provided under Section 5 in Part I and Part II will be indexed in accordance with Schedule 1

SCHEDULE 9

FORM OF SELLER LETTER OF CREDIT

[ISSUED ON ISSUING BANK LETTERHEAD
SHOWING FULL NAME AND ADDRESS]

Date and Place of Issue:

Applicant

Name The _________________ Power Seller, Limited
Address ______________, Pakistan

Advising and Negotiating Bank

[name and address]
__________, Pakistan

Beneficiary

Purchaser
[address]
_________, Pakistan

Attention:

We hereby issue our documentary credit as follows:
Type of Credit:
Irrevocable

Letter of Credit Number:

Date and Place of Expiry:

Date -
Place - [Advising and Negotiating Bank name and address]

Amount
[figures]
[words]

Credit available with: [Advising and Negotiating Bank], by negotiation against presentation of the documents detailed herein and of your draft(s) at sight drawn on Issuing Bank accompanied by a certificate signed on your behalf by a person describing himself therein as your duly authorized officer stating that:

A. This drawing in the amount of [currency and amount] is being made pursuant to the Energy Purchase Agreement (Agreement) between the _____________ Power Company, Limited ("Seller") and the Purchaser as a result of Seller's failure to perform in accordance with Article/Section _____________ of the Agreement."

OR

B. "The Purchaser is making a drawing in the full available amount of [Issuing Bank] Letter of Credit No. ____________ because the term of the Letter of Credit will expire within ten (10) business days of the date of this certificate and The __________ Power Company, Limited ("Seller") has failed to deliver a replacement or renewal Letter of Credit acceptable to the Purchaser, and security is still required under the terms of Article/Section ______ of the Energy Purchase Agreement between the Seller and the Power Purchaser, dated __ ______ 200_."

Presentation of the above certificate and all communications in writing with respect to this Letter of Credit shall be addressed to us at [Issuing Bank name and address] referencing Letter of Credit No. __________, Attention: __________, or at [Advising and Negotiating Bank name and address] referencing Letter of Credit No. _________, Attention: ________________.

This Letter of Credit sets forth in full the terms of our undertaking and this undertaking shall not in any way be modified, amended, limited, or amplified by reference to any document, instrument, or agreement referred to herein, except only the certificates and draft referred to herein; and any such reference shall not be deemed to incorporate herein by reference any document, instrument, or agreement except for such certificates.

This Letter of Credit is transferable. Transfer may be effected only by Issuing Bank upon our receipt of an acceptable application for transfer accompanied by the original Letter of Credit and payment of our transfer commission in effect at the time of transfer.

Partial drawings are allowed.

Tested telex reimbursement is allowed.

Drafts drawn under this Letter of Credit must bear the clause:

> "Drawn under [Issuing Bank] Letter of Credit No. ______________, dated __ ______________ 2008."

It is a condition of this Letter of Credit that it shall be automatically extended for an additional period of one year from the present and each future expiration date, unless, thirty (30) days prior to the then-current expiration date, we notify you by registered mail that this Letter of Credit will not be renewed for an additional period.

We hereby engage with you that drafts drawn strictly in compliance with the terms of this credit and amendments shall meet with due honor upon presentation. This credit is subject to "Uniform Customs and Practice for Documentary Credits" (1983 Revision), International Chamber of Commerce, Publication No. 600.

Authorised Signature

Authorised Signature

SCHEDULE 10

WIND SPEED MEASUREMENT PROTOCOL

1. Mast Locations

The Seller shall provide two met masts, Mast A and Mast B which allow anemometry to be placed at hub height and lowest blade tip height (Note: Should the wind farm contain turbines with different hub heights then the anemometry will be installed at the relevant height that corresponds to the most frequent hub height). Mast A will be upwind of the Complex for the dominant wind direction. Mast B will be downwind at a suitable location to be agreed by the Operating Committee. The free stream (non-wake obstructed) directions for each mast will be calculated according to IEC 61400-12-1. The locations of the two masts will be such that when the free stream directions from the two masts are combined they cover the maximum free stream wind flow from the 360° direction range. In the case that future construction of wind farms or other obstacles affect the free stream sectors of the measurement masts then this will be assessed by an independent engineer to establish whether there is a significant effect on wind speed measurement. If a significant effect is found, the independent engineer will be requested to determine whether it is possible to relocate the mast to a more appropriate location within the wind farm boundary in order to minimise the wake effects.

2. Mast Equipment and Calibration

Each mast will have the following equipment: two anemometers at hub height of the most frequently occurring wind turbine (the "Operational Anemometers"), one anemometer at the lowest blade tip height of the most frequently occurring wind turbine, and one wind vane, all mounted according to IEC 61400-12-1; transducers for the measurement of air pressure and temperature. In addition installed on each mast will be temperature, pressure and relative humidity instrumentation. All anemometers will be calibrated initially prior to installation. Calibration will be undertaken in a Measnet accredited wind tunnel using Measnet standards, as given in IEC 61400-12-1. The Operational Anemometers on Mast A will be designated MA1 and MA2; the Operational Anemometers on Mast B will be designated MB1 and MB2. The Operational Anemometers will be calibrated annually. The lower anemometer will be calibrated as necessary by the discretion of the Engineer. The calibration procedure will be undertaken so that there is always one anemometer on each mast. In addition to the four Operational Anemometers there will be a fifth anemometer of identical type designated the Reference Anemometer. On each occasion that any of the Operational Anemometers are calibrated the Reference Anemometer will also be calibrated. Except when undergoing calibration, the Reference Anemometer will be kept securely under good storage conditions, at an independent site to be agreed on by all parties in advance of the initial operational period.

The calibration of the anemometers will be used to ensure that accurate wind speeds are obtained from the masts on a regular and continuous basis. They will be used, together with the other provisions of IEC 61400-12-1, to program the data loggers attached to the mast to provide accurate absolute measurement of the undisturbed wind speed. The annual recalibration will be undertaken in the same tunnel as the original calibration. If that tunnel becomes unavailable then an equivalent tunnel will be used. The tunnel will be selected by the Operating Committee and will, as far as possible, have similar characteristics to the original tunnel and will, in any case, be Measnet accredited. Should Measnet cease to exist then the Operating Committee will select a suitable tunnel confirming as closely as possible to Measnet standards. The calibration coefficients derived from the latest calibration tests will be deemed to be current and valid until the re-calibrated anemometers are installed.

After each calibration, results will be compared with the results for the Reference Anemometer. The results will be presented in the form slope k and offset p such that speed = k x V + p where V is the voltage output from the anemometer. If the wind speed indicated by any anemometer using its original calibration settings at 8 m/s as registered on the Reference Anemometer is more than 0.1 m/s different from that of the measured Reference Anemometer under the same conditions the anemometer will be replaced. The anemometer and wind vane should be replaced if one of the parties request it or after 3 years of operation. The cup-anemometer should be of class A2.0 or better.

The Reference Anemometer will be used to ensure continuity of data if and when the wind tunnel used for calibration is changed.

The data from all the masts including the temperature and pressure data will be recorded by the data loggers. Two data loggers will be provided for each mast. One data logger at each mast will be designated the Master Logger. The data from this Master Logger will be used exclusively unless, at the total discretion of the Engineer, the Engineer considers that the Master Logger is faulty in which case the other logger will become the Master Logger and the faulty logger will be replaced. The logger newly designated as the Master Logger will remain the Master Logger unless or until it also becomes faulty and the process will be repeated. It will be the duty of the Seller to ensure that there are always two operational loggers at each mast. The data loggers will be installed and sealed so that they are "tamper proof". They will be time synchronized with one another and also with the SCADA system to within 30 seconds. Each record recorded by the data loggers will be time stamped. 10-minute mean values will be saved for the following variables: wind speed on anemometers MA1, MA2, MB1, MB2; wind direction, temperature, and pressure on each mast.

The data logger will be capable of retaining these data for a minimum of three months. Data will be downloaded on a weekly basis by cell phone or other remote communication means. In the event of failure of the remote interrogation system, data will be downloaded physically on a monthly basis.

3. <u>Data Processing</u>

The data will be sent simultaneously to the Purchaser, the Seller and the Engineer. The Seller will compute air temperature and pressure and resulting air density at hub height according to IEC 61400-12-1 for each 10 minute period. The monthly mean air density value will be a simple mean calculated by summing all the 10 minute means and dividing by the number of samples. The Seller will send the monthly mean air density value to the Purchaser and the Engineer. Should there be an absence of mast recorded data used in the calculation of air density for any whole month, or significant proportion of a month, the Engineer may use professional judgment to determine the air density at the site from another data source.

Skipped Data could disturb the 10 minute mean wind speed values at the master logger so in order to improve the data quality the methodology given in section 4 should be used to maintain the data quality. At the end of each month the 10 minute mean wind speeds from the Operational Anemometers for the period will be provided to the Purchaser, the Seller and the Engineer. These will be based on wind speeds recorded at Mast A, Mast B or Turbine X (see Section 4 below), as per the methodology laid out below. These data will be combined with the air density corrected Complex Power Curve (CPC) as discussed later in this document.

4. Establishing Back-up Measurements

During the first three months of operation the Engineer will undertake a correlation between MA1 and MA2 and, separately, between MB1 and MB2, where the numbers 1 and 2 denominate the two Operational Anemometers. The correlation will be undertaken using a standard linear least squares fit, forced through the origin. This will result in a gradient value for each relationship. The gradient will be designated the MA Reference Gradient (MARG) for Mast A and the MB Reference Gradient (MBRG) for Mast B. The gradient will be calculated on a monthly basis to determine the Mast A Gradient (MAG) and the Mast B Gradient (MBG).

If the absolute difference between MAG and MARG is greater than 1% then the Engineer shall investigate the reason and recommend specific actions to the Operating Committee. Such a change is likely to be due to degradation of bearings or damage to the cups. The same procedure will be followed for Mast B.

In addition to a monthly review of the gradients discussed above, each month all concurrent MA1 and MA2 records within that month where the difference between the two values is greater than 0.5m/s will be identified. The Engineer shall investigate the reason and identify the preferred anemometer in each case.

On each mast, the #1 anemometer shall be used as the Primary Anemometer. If the #1 anemometer is not operational or is considered to be defective by the Engineer as described above then the #2 anemometer shall be used as the Primary Anemometer. This process shall be applied to both Mast A and Mast B.

Should any of the anemometers fail in the first three months of operation, before suitable relationships have been established between anemometers, then the readings of the remaining functional anemometer on that mast will be used directly until the faulty anemometer has been replaced with an appropriate replacement. This will be carried out as soon as is practicable. After replacement a new three month correlation period will commence.

The wind vane readings on Mast A will be used to determine the wind direction. If the Engineer considers that the wind vane readings on Mast A are incorrect or corrupted then wind vane readings from Mast B will be used in their place. If the wind vanes on both Mast A and Mast B are considered to be incorrect then the nacelle direction as recorded for [Turbine X] on the wind farm SCADA will be used in their place. This information will be obtained by the Engineer using the time stamped and synchronized data which links the data loggers and the SCADA.

Before operation the Engineer shall define two sets of wind directions. Directions A are those wind directions for which Mast A experiences free stream wind speeds. Directions B are those wind directions for which Mast B experiences free stream speeds. These directions will be calculated using the method outlined in IEC 61400-12-1. It is recognized that there may be difficulties in ensuring that wind speed is always unperturbed at these masts. The Engineer shall use his professional judgment to determine the best compromise that is available. All directions will be defined as either Directions A or Directions B. During Directions A Mast A will be used as the Current Mast; during Directions B Mast B will be used as the Current Mast. The Preferred Signal will be the Primary Anemometer on the Current Mast. For directions where free stream wind is measured by both masts, measurements from Mast A will be used, unless there is a material reason for using data from Mast B, as decided by the Engineer.

In addition to Mast A and Mast B, a wind turbine (Turbine X) will also be chosen to act as a back up source of wind speed data in the case that both masts stop recording data. The chosen turbine will be the one that has a hub height that is the most frequent in the wind farm and can be shown to record free stream wind speed data (as per IEC 61400-12-1) for the greatest proportion of time.

For each month, the 10 minute records will be submitted to the Purchaser, the Seller and the Engineer. Each record shall include: the time stamp, wind speed, temperature and pressure and state for each record the Primary Anemometer.

Each year a photographic panorama view from each met mast (at anemometer height) will be taken to monitor changes in land use. Any changes will be documented and these documents and the photographs will be made available to the Purchaser, the Seller and the Engineer.

During normal operational conditions experienced during the first six months of operation correlations will be performed between each of the five wind speed signals with each of the other four wind speed signals for Directions A and Directions B.

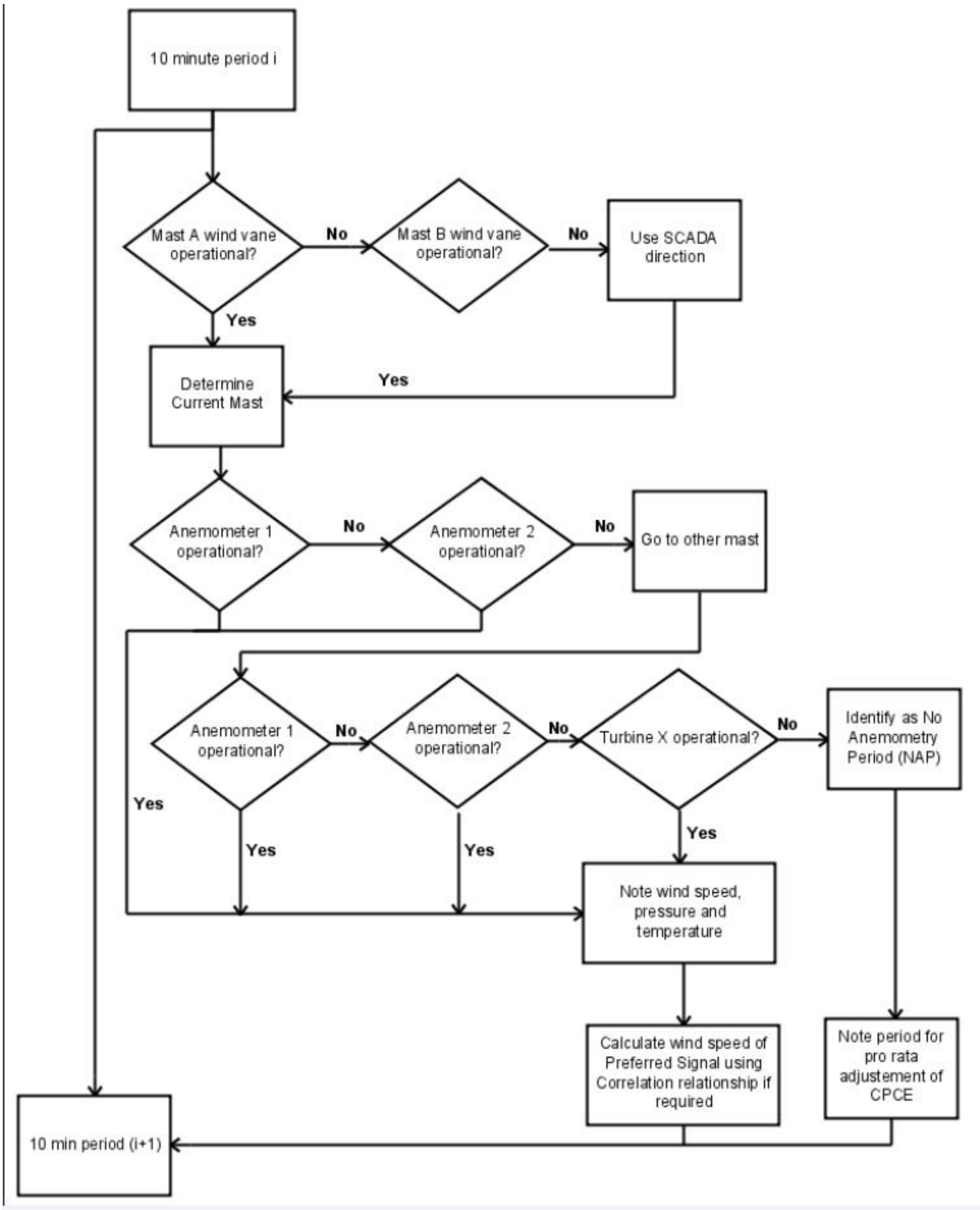
	MA1	**MA2**	**MB1**	**MB2**	**Turbine X**
MA1	X				
MA2		X			
MB1		*	X		
MB2				X	
Turbine X					X

For each of these two (one for each of Directions A and Directions B) sets of twelve mast correlations the relationship (the “Correlation Relationships”) will be established between wind speeds in the following form: $M_i = m_{ij} M_j + c_{ij}$ where i,j identify the two masts i = B1, j = A2 for the cell identified by “*”above. A further two sets of eight relationships will be established between each of the four mast anemometers and the Turbine X anemometer in a similar way. Again, these relationships will be established for Directions A and Directions B.

The values of each of the parameters m and c will be determined by a linear least squares fit. The value of these parameters will be deemed to be fixed after the first 6 months of operation have been completed. The Engineer may decide that the parameters are fixed before that time and if the Engineer can convince the Operating Committee that there is no benefit in collecting further data then the parameters may be fixed at that point. These correlations will be used to provide a signal in the case where the Preferred Signals are not available. The flowchart below outlines this procedure.

Should Turbine X be unavailable to provide back up wind speed data for the period required then an alternative turbine should be employed following the procedures above. Note that in this situation the correlations for the alternative turbine will be derived.

In the case that there neither Mast A, Mast B or any of the wind turbines are available to provide wind speed data then the wind speed will be taken to be an average of the values recorded for the last available full 10 minute record before loss of data and the first available full 10 minute record after loss of data.



At the end of the period the relevant values of wind speed and air density are calculated. If none of the anemometry is working, periods are removed from the procedure. During such periods (no anemometry periods or NAP) the mean wind speed over the NAP (calculated using the method above) will be used for each 10 minute period for the duration of the NAP.

SCHEDULE 11

NPMV MEASUREMENT PROTOCOL

<u>"Non Project Missed Volume" or "NPMV"</u> - The volume of Net Delivered Energy not delivered by the Complex which non delivery is due to a Non-Project Event(s) calculated as follows:

NPMV = $\mathbf{CMPCE_{npe} * [(WAD_{npe} + SU_t) / T_m] * AAF}$

where,

$\mathbf{CMPCE_{npe}}$ = **Complex Monthly Power Curve Energy, corresponding to the Monthly NPE Wind Speed for the given Month;**

where,

"**<u>Complex Power Curve Energy</u>**" - The quantity of Net Delivered Energy the Complex is capable of generation and delivery during a given Month at the Interconnection Point corresponding to each node (graded to one-tenth of a meter per second) on the spectrum of wind speed ranging from the Cut In Wind Speed to the Cut Out Wind Speed of the WTGs comprised in the Complex, as stated in Part I of the Benchmark Energy Table.

"**<u>Monthly NPE Wind Speed</u>**" - The mean speed of the wind at the Site over the duration of all Non Project Events in a given Month (expressed in meters per second), calculated as the mean of the actual wind speed measurements recorded during the periods of all Non Project Events in that Month by the Anemometry System (at which the data logger records the wind speed) from which a ten (10) minute mean shall be derived and all the said ten (10) minutes means during the periods of all Non Project Events in a given Month shall be used to compute the said mean speed over that Month.

$$\mathbf{WAD_{npe} = \Sigma (T * A / B)}$$

where,

WAD_{npe}= Weighted Average Duration of the Non Project Event's, which is the sum of the duration of each Non Project Event in a given Month (in minutes) adjusted for the proportion of the total installed WTG's which had to be curtailed due to each such Non Project Event.

T = the duration of each Non Project Event in a given Month in minutes

A = the number of WTG's, on which the Non Project Event is applicable or which had to be curtailed due to each Non Project Event

B = the total number of installed WTG's in the Complex

$$\mathbf{SU_t = \Sigma\ (NPE * t)}$$

where,

SU_t = The time required for staggered start up of all of the WTGs for safe introduction to the Grid System in minutes

NPE's = Number of Non Project Events in a given Month, in case of a single Non Project Event lasting the whole of the given month than the Number of Non Project Events in a given Month will be zero.

t = 1 min per turbine

T_m = Number of minutes for such Month in which NPE occurs

$$\mathbf{AAF = (NDE_p + NPMV_p) / CMPCE_{maws/p}}$$

where,

AAF= Apparent Availability Factor, which is the average availability factor of the Complex during the Period.

Period= The period of twelve (12) calendar months prior to the given Month, provided that if a Non Project Event occurs:

(i) during the first month following the Commercial Operations Date, then the period shall be from the Commercial Operations Date to the last hour immediately preceding the Non Project Event.

(ii) after the first month and before the completion of one year, then the period shall be from the Commercial Operations Date to the last completed calendar month prior to the Non Project Event.

The maximum value of Availability factor shall be limited to 100%.

NDE_p = Net Delivered Energy for the Period preceding the Month(s) in which NPE(s) occurred;

$NPMV_p$ = Non-Project Missed Volume for the Period preceding the Month(s) in which NPE(s) occurred;

$CMPCE_{maws/p}$ = Complex Monthly Power Curve Energy, corresponding to the Monthly Actual Wind Speed for the Period preceding the Month(s) in which NPE(s) occurred;

EXAMPLE # 1

NPMV Calculation during the First Month after Commissioning

CMPCE table for the month under consideration is as follows;

S #	Wind Speed (m/s)	CMPCE (GWh/month)
1	3.0	0.3
2	3.1	0.4
3	3.2	0.4
4	3.3	0.5
5	3.4	0.5
6	3.5	0.6
7	3.6	0.7
8	3.7	0.9
9	3.8	1.0
10	3.9	1.1
11	4.0	1.3
12	4.1	1.5
13	4.2	1.6
14	4.3	1.8
15	4.4	2.0
16	4.5	2.2
17	4.6	2.4
18	4.7	2.7
19	4.8	2.8
20	4.9	3.1
21	5.0	3.3
22	5.1	3.7
23	5.2	3.9
24	5.3	4.2
25	5.4	4.5
26	5.5	4.8

S #	Wind Speed (m/s)	CMPCE (GWh/month)
27	5.6	5.0
28	5.7	5.4
29	5.8	5.7
30	5.9	6.0
31	6.0	6.3
32	6.1	6.7
33	6.2	7.0
34	6.3	7.3
35	6.4	7.7
36	6.5	8.1
37	6.6	8.4
38	6.7	8.8
39	6.8	9.2
40	6.9	9.4
41	7	9.8
42	7.1	10.2
43	7.2	10.5
44	7.3	10.9
45	7.4	11.3
46	7.5	11.6
47	7.6	12.0
48	7.7	12.4
49	7.8	12.7
50	7.9	13.1
51	8	13.5

Summary of Non Project Events during the Month:

1. First Non Project Events of the Month

Day 10, from 1430-1800 hrs,

T = 210 minutes, A=33, B=33,

Ten (10) minute mean of actual wind speed measurements recorded during the period of Non Project Event by the Anemometry System

S #	Time	10 minute mean of actual wind speed measurements
1	1440 hrs	6.0 m/s
2	1450 hrs	6.0 m/s
3	1500 hrs	6.1 m/s
4	1510 hrs	6.1 m/s
5	1520 hrs	5.8 m/s
6	1530 hrs	5.8 m/s
7	1540 hrs	5.7 m/s
8	1550 hrs	5.9 m/s
9	1600 hrs	6.1 m/s
10	1610 hrs	6.1 m/s
11	1620 hrs	6.1 m/s

S #	Time	10 minute mean of actual wind speed measurements
12	1630 hrs	6.1 m/s
13	1640 hrs	6.1 m/s
14	1650 hrs	6.2 m/s
15	1700 hrs	6.2 m/s
16	1710 hrs	6.2 m/s
17	1720 hrs	6.3 m/s
18	1730 hrs	6.3 m/s
19	1740 hrs	6.1 m/s
20	1750 hrs	6.1 m/s
21	1800 hrs	6.1 m/s
Total		**127.4**

2. Second Non Project Events of the Month

Day 30, from 1800- 1900 hrs

T = 60 minutes, A=30, B=33

Ten (10) minute mean of actual wind speed measurements recorded during the period of Non Project Event by the Anemometry System

S #	Time	10 minute mean of actual wind speed measurements
1	1810 hrs	5.5 m/s
2	1820 hrs	5.5 m/s
3	1830 hrs	5.4 m/s

S #	Time	10 minute mean of actual wind speed measurements
4	1840 hrs	5.4 m/s
5	1850 hrs	5.4 m/s
6	1900 hrs	5.4 m/s
Total		**32.6**

Calculation of Non Project Missed Volume for the Month

a) $\mathbf{CMPCE_{npe}}$

Monthly NPE Wind Speed = $\sum x / n$

where

x = 10 minute mean of actual wind speed measurements during the Non Project Event during the given Month

n = number of 10 minute means during the Non Project Events during the given Month (number of observations)

Monthly NPE Wind Speed = (127.4 + 32.6) / (21 + 6) = 5.93 m/s ~ 5.9 m/s

$CMPCE_{npe}$ = **6 GWh** (from table)

b) WAD_{npe}

WAD_{npe} = Σ (T * A / B)
= (210 * 33 / 33) + (60 * 30 / 33)
= **264 minutes**

c) SU_t

SU_t = Σ (NPE * t)
= (1* 33) + (1*30) = **63 minutes**

d) T_m

T_m = Number of minutes in a given Month
= (30 * 24 * 60) = **43,200 minutes**

e) AAF

NDE_p = NDE before first NPE = 1.9GWh

$NPMV_p$ = Nil

$CMPCE_{maws/p}$ = (6.7 * 13,470) /(30 * 24 * 60) = 2.08909 GWh

where

Time lapsed before the 1st NPE	= 9 days 8 hrs 30 min = 13,470 minutes
Average wind speed before 1st NPE	= 6.1 m/s
CMPCE @ 6.1 m/s	= 6.7 GWh

Now

AAF = (NDE_p + $NPMV_p$) / $CMPCE_{maws/p}$

AAF = 1.9 / 2.08909 = **0.91** (i.e. 91%)

NPMV = $CMPCE_{npe}$ * [(WAD_{npe} + SU_t) / T_m] * AAF

= (6 GWh * (264 + 63) / 43,200) * 0.91

NPMV = **0.04133 GWh**

EXAMPLE # 2

NPMV Calculation after the First 12 Month of Commissioning (all data same as the first example except for the Month, which in this example is not the first month after Commissioning)

CMPCE table for the month under consideration is as follows;

S #	Wind Speed (m/s)	CMPCE (GWh/month)
1	3.0	0.3
2	3.1	0.4
3	3.2	0.4
4	3.3	0.5
5	3.4	0.5
6	3.5	0.6
7	3.6	0.7
8	3.7	0.9
9	3.8	1.0
10	3.9	1.1
11	4.0	1.3
12	4.1	1.5
13	4.2	1.6
14	4.3	1.8
15	4.4	2.0
16	4.5	2.2
17	4.6	2.4
18	4.7	2.7
19	4.8	2.8
20	4.9	3.1
21	5.0	3.3
22	5.1	3.7
23	5.2	3.9
24	5.3	4.2
25	5.4	4.5
26	5.5	4.8

S #	Wind Speed (m/s)	CMPCE (GWh/month)
27	5.6	5.0
28	5.7	5.4
29	5.8	5.7
30	5.9	6.0
31	6.0	6.3
32	6.1	6.7
33	6.2	7.0
34	6.3	7.3
35	6.4	7.7
36	6.5	8.1
37	6.6	8.4
38	6.7	8.8
39	6.8	9.2
40	6.9	9.4
41	7	9.8
42	7.1	10.2
43	7.2	10.5
44	7.3	10.9
45	7.4	11.3
46	7.5	11.6
47	7.6	12.0
48	7.7	12.4
49	7.8	12.7
50	7.9	13.1
51	8	13.5

Summary of Non Project Events during the Month:

1. First Non Project Events of the Month

Day 10, from 1430-1800 hrs,

T = 210 minutes, A=33, B=33,

Ten (10) minute mean of actual wind speed measurements recorded during the period of Non Project Event by the Anemometry System

S #	Time	10 minute mean of actual wind speed measurements
1	1440 hrs	6.0 m/s
2	1450 hrs	6.0 m/s
3	1500 hrs	6.1 m/s
4	1510 hrs	6.1 m/s
5	1520 hrs	5.8 m/s
6	1530 hrs	5.8 m/s
7	1540 hrs	5.7 m/s
8	1550 hrs	5.9 m/s
9	1600 hrs	6.1 m/s
10	1610 hrs	6.1 m/s
11	1620 hrs	6.1 m/s

S #	Time	10 minute mean of actual wind speed measurements
12	1630 hrs	6.1 m/s
13	1640 hrs	6.1 m/s
14	1650 hrs	6.2 m/s
15	1700 hrs	6.2 m/s
16	1710 hrs	6.2 m/s
17	1720 hrs	6.3 m/s
18	1730 hrs	6.3 m/s
19	1740 hrs	6.1 m/s
20	1750 hrs	6.1 m/s
21	1800 hrs	6.1 m/s
Total		**127.4**

2. Second Non Project Events of the Month

Day 30, from 1800- 1900 hrs

T = 60 minutes, A=30, B=33

Ten (10) minute mean of actual wind speed measurements recorded during the period of Non Project Event by the Anemometry System

S #	Time	10 minute mean of actual wind speed measurements
1	1810 hrs	5.5 m/s
2	1820 hrs	5.5 m/s
3	1830 hrs	5.4 m/s

S #	Time	10 minute mean of actual wind speed measurements
4	1840 hrs	5.4 m/s
5	1850 hrs	5.4 m/s
6	1900 hrs	5.4 m/s
Total		**32.6**

Calculation of Non Project Missed Volume for the Month

a) $CMPCE_{npe}$

Monthly NPE Wind Speed = $\sum x / n$

where

x = 10 minute mean of actual wind speed measurements during the Non Project Event during the given Month

n = number of 10 minute means during the Non Project Events during the given Month (number of observations)

Monthly NPE Wind Speed = (127.4 + 32.6) / (21 + 6) = 5.93 m/s ~ 5.9 m/s

$CMPCE_{npe}$ **=** **6 GWh** (from table)

b) $\mathbf{WAD_{npe}}$

$$WAD_{npe} = \Sigma (T * A / B)$$
$$= (210 * 33 / 33) + (60 * 30 / 33)$$
$$= \mathbf{264\ minutes}$$

c) $\mathbf{SU_t}$

$$SU_t = \Sigma (NPE * t)$$
$$= (1* 33) + (1*30) = \mathbf{63\ minutes}$$

d) $\mathbf{T_m}$

T_m = Number of minutes in a given Month

= (30 * 24 * 60) = **43,200 minutes**

e) **AAF**

(All data for the previous 12 calendar months to the month for which NPMV is being calculated)

NDE_p = 120 GWh

$NPMV_p$ = 10 GWh

$CMPCE_{maws/p}$ = 135 GWh

Now

$$AAF = (NDE_p + NPMV_p) / CMPCE_{maws/p}$$

$$AAF = (120 + 10) / 135 = \mathbf{0.963} \qquad \text{(i.e. 96.3\%)}$$

$$\mathbf{NPMV = CMPCE_{npe} * [(WAD_{npe} + SU_t) / T_m] * AAF}$$

$$= (6\ GWh * (264 + 63) / 43{,}200) * 0.963$$

NPMV = **0.04374 GWh**