Annex 5: Leguan Wind Power Plant

Operation and Maintenance Requirements

**Guyana Energy Agency**

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# 1.0 Objective

The overall objective of the Wind Power Plant Operation and Maintenance (O&M) Contract is to perform the following:

* Operate and maintain the wind turbine, plant, and ancillary equipment.
* Ensure safe and optimal operation of the wind power plant through preventive and corrective maintenance best practices.
* Monitor turbine status, wind conditions, and energy production.
* Analyze incidents to identify root causes and implement mitigation measures.
* Proactively address potential operational issues before they escalate into major problems.
* Develop and carry out predictive and preventive maintenance activities.

The primary aim of the O&M activities is to maximize the availability and performance of the wind turbines, extending the plant's useful lifespan. The awarded contractor shall guarantee at least **95% turbine availability**. The availability will be calculated using the formula below:

**Turbine Availability (%) = [Actual operating hours - Planned downtime) / (Total hours in the period - Excluded hours)] × 100%**

Planned downtimes for inspections and routine maintenance are excluded from the availability guarantee. The contractor will not be responsible for energy production losses due to grid outages or force majeure events.

# 2.0 Conditions of the O&M

The contractor shall adhere to the following conditions for the O&M Contract:

1. The O&M Contract will have a minimum duration of **12 months**.
2. **Turbine Availability Guarantee**: 95%, subject to grid availability.
3. The contractor shall provide all spare parts, consumables and Tools & Tackles needed for repairs and maintenance for a duration of 12 months.
4. The contractor will deploy trained and qualified technicians to inspect, adjust, repair, monitor, and maintain the wind power plant.
5. The contractor should obtain permission in writing from the contracting agency to access the wind turbines and related infrastructure for maintenance services.
6. All routine maintenance activities will be performed during normal working hours.
7. Major repairs and additional services will be carried out only upon authorization from the contracting agency and billed at rates mutually agreed upon by both parties.

# 3.0 General Description of the Services

The services include operation, monitoring, maintenance, and repair of the wind turbine, meteorological station, SCADA system, and ancillary equipment.

## 3.1 Operations

The scope of work for operating the 500 kW Wind Power Plant includes:

* Daily monitoring of wind turbine performance, including energy output, wind speeds, and equipment status.
* Performing next-day forecasting of energy production and wind conditions to support grid management and operational planning.
* Ensuring compliance with safety regulations and industry standards.
* Documentation of operational activities and performance metrics, including turbine availability and downtime.
* Reporting incidents, faults, and performance metrics to the contracting agency every month.
* Optimizing turbine performance by analyzing trends and key performance indicators (KPIs).
* Scheduling operational adjustments to improve energy yield and efficiency.
* Ensuring real-time communication with the contracting agency for operational updates.
* Providing recommendations for turbine optimization or upgrades based on performance data.
* Managing inventory and spare parts for wind turbines and auxiliary equipment.

## 3.2 Maintenance

The maintenance tasks include the following planned activities:

|  |  |  |  |
| --- | --- | --- | --- |
| **No** | **Equipment** | **Activity Description** | **Frequency** |
| 1 | **Wind Turbines** | Blade inspection and cleaning | Quarterly |
| Check for blade cracks, erosion, and lightning strikes | Quarterly |
| Lubricate moving parts, including pitch systems | Semi-Annually |
| Perform thermal imaging on electrical components | Annually |
| Tighten bolts, screws, and fasteners | Semi-Annually |
| 2 | **Yaw and Pitch Systems** | Inspect and adjust yaw motors and gears | Quarterly |
| Monitor the pitch control system for errors | Quarterly |
| 3 | **Gearbox and Bearings** | Oil sampling and filtration | Semi-Annually |
| Check the gearbox for noise or vibrations | Quarterly |
| Inspect and grease for bearings | Semi-Annually |
| 4 | **Generator** | Inspect insulation and clean dust buildup | Semi-Annually |
| Check electrical connections for tightness | Quarterly |
| 5 | **Electrical Systems** | Inspect transformers and perform thermal scanning | Annually |
|  | Inspect cabling and connections | Quarterly |
| 6 | **SCADA and Monitoring** | Verify sensor data integrity | Monthly |
| Check data logger connectivity | Weekly |
| 7 | **Tower Structure** | Inspect for corrosion, cracks, or deformation | Semi-Annually |
| Check bolts and flanges for tightness | Annually |
| 8 | **Meteorological Station** | Inspect wind sensors and replace as needed | Quarterly |
| Clean anemometers and verify calibration | Annually |

**Note**: Emergency or corrective maintenance tasks will be carried out within 48 hours of issue identification.

The schedule for the above maintenance activities is to be indicated in one month advance (monthly report).

# 4.0 Safety

The contractor must ensure:

* All safety equipment, including fire extinguishers and alarms, is functional and in compliance with regulations.
* Turbines and associated equipment display proper signage and labels.
* Technicians follow strict safety protocols during operation and maintenance activities.

# 5.0 Deliverables and Documentation

* The contractor will deliver the following:
* ***Performance Reports:***
* Daily, monthly, and annual reports summarizing turbine availability, energy production, and incidents.
* ***Maintenance Logs:***
* Detailed records of preventive, predictive, and corrective maintenance activities.
* ***Incident Reports:***
* Comprehensive analysis of faults or failures, including root cause analysis and corrective actions.
* ***Inventory Records:***
* Documentation of spare parts and consumables inventory.
* ***Safety Compliance Documentation:***
* Records of safety audits, training sessions, and adherence to safety protocols.

# 6.0 Training

The contractor shall provide an extensive and continuous training program to the Contracting Agency’s and power utility (GPL Inc) personnel to ensure seamless operations and basic troubleshooting both during and after the O&M contract period. The training must be designed to progressively build knowledge and technical competence, enabling the personnel to take over plant operations independently post-contract.

## 6.1 Training Objectives

* Equip the Contracting Agency’s and power utility (GPL Inc) personnel with a thorough understanding of wind turbine systems and associated equipment.
* Develop skills in routine operations, monitoring, and maintenance practices.
* Instill awareness and adherence to safety protocols and regulatory compliance.
* Provide hands-on training for fault diagnosis and troubleshooting to resolve operational issues effectively.
* Foster familiarity with inventory management and spare parts handling.

## 6.2 Training Scope and Content

The training program must include both theoretical sessions and practical, hands-on learning modules covering the following areas:

1. **System Overview**: (at the Commissioning stage)
	* Detailed introduction to the 500 kW wind turbines, SCADA system, meteorological station, and ancillary equipment.
	* Understanding the energy generation process, power curves, and equipment interconnectivity.
2. **Routine Operations**: (after 3 months from date of commissioning)
	* A step-by-step guide to daily monitoring, interpreting performance data, and identifying anomalies.
	* Preparation and submission of operational reports, including turbine availability and energy output.
	* Real-time operational adjustments to optimize performance.
3. **Safety Procedures**: (after the site preparation works)
	* Comprehensive training on the use of personal protective equipment (PPE).
	* Identification of workplace hazards and implementation of mitigation measures.
	* Emergency response protocols for various scenarios, including fire, electrical faults, or turbine shutdowns.
4. **Preventive Maintenance**: (after 1 month from the date of commissioning)
	* Conducting minor inspections, cleaning, and lubrication tasks.
	* Understanding maintenance schedules and performing condition-based checks.
	* Preparing maintenance records and ensuring proper documentation of activities.
5. **Corrective Maintenance and Fault Diagnosis**: (after 2 months from the date of commissioning)
	* Identifying and diagnosing common faults in turbines, SCADA systems, and associated equipment.
	* Performing basic corrective actions to resolve minor faults.
	* Escalating critical issues requiring advanced intervention.
6. **Inventory Management**:
	* Understanding spare parts inventory requirements and tracking usage.
	* Familiarity with inventory software (if applicable) and spare parts procurement processes.
7. **Next-Day Forecasting**: (after 6 months from the date of commissioning)
	* Training on wind energy forecasting methodologies, interpreting weather data, and using forecasting tools.
	* Incorporating forecasts into operational planning for optimal energy yield.

## 6.3 Training Delivery

1. **Initial Training Program**:
	* A structured training schedule must be implemented within the first month of the O&M contract.
	* The initial training will focus on system fundamentals, safety protocols, and routine operations.
2. **On-the-Job Training**:
	* Continuous hands-on training shall be provided throughout the O&M period.
	* Personnel will participate in real-time operations, maintenance, and troubleshooting under the contractor’s supervision.
3. **Periodic Refresher Training**:
	* Refresher training sessions must be conducted every four months to reinforce key concepts and update personnel on operational best practices.
	* Sessions should address new challenges encountered during the O&M period and provide tailored solutions.
4. **Workshops and Simulations**:
	* The contractor shall organize workshops and fault simulation exercises to prepare personnel for real-world scenarios.

## 6.4 Training Documentation

* The contractor must provide a detailed training manual, covering all aspects of the wind power plant operations and maintenance.
* Training materials must include presentations, troubleshooting guides, and safety handbooks.
* A training attendance log must be maintained, and certificates of completion must be issued to personnel who successfully complete the program.

## 6.5 Final Knowledge Transfer

* Before the end of the O&M contract, the contractor shall conduct an intensive final training session to consolidate knowledge and address any gaps.
* The contractor must ensure that the Contracting Agency’s personnel are fully equipped to handle all routine and emergency scenarios independently.

# 7.0 Spare Parts and Consumables

The contractor is responsible for the provision, storage, and management of consumables and spare parts for routine and corrective maintenance for the first **12 months** of the contract. This includes, but is not limited to:

* Lubricants, filters, and cleaning agents.
* Replacement parts for mechanical, electrical, and electronic systems.
* Consumable for routine inspection and testing.

List of vendors supplying consumables and spare parts, including cost aspects to be shared in a monthly report

# 8.0 Warranty Management

The contractor will coordinate with equipment manufacturers and suppliers to manage warranties and claims during the O&M period. This includes:

1. Identifying defects or failures covered under warranty.
2. Facilitating communication between the principal and manufacturers.
3. Ensuring timely execution of warranty-related repairs or replacements.