

Feasibility Study for the Installation of Two Wind Turbines of 5KW and 10KW for Electrical Generation on the Hills Surrounding National University of Engineering

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ABSTRACT: This report contains the technical proposal for the project entitled "Installation and commissioning of a wind turbine 5kW and 10kW on the hill of the Faculty of Mechanical Engineering" which purports to be a period of 4 months to operation, having a total cost of 82 650 new soles.

The project is in collaboration with the CER-UNI thus promoting the use of renewable energy. The same is intended to have a research and training in the management and operation of small wind turbines.

Another contribution is expected to begin the evaluation of wind potential, which has Hill National University of Engineering and likewise intends to have knowledge in the operation of these micro-turbines IP.

At the end of this report, detailing the cost and time for this project is included. Note that this is only a preliminary report, which will be held in the project during the same fortnight detailing the activities and progress on schedule.

KEYWORDS: Wind turbine, renewable energy, wind potential.

1. INTRODUCTION

In the Faculty of Electrical Engineering and Electronics is has donated one of two 5 kW wind turbines and a 10 kW by the company PROVEJEC thus was born the initiative to install two wind turbines on the hill of the FIM.

It is our understanding that hill FIM has a promising wind potential due to an effect called "Hill effect" in which the wind is compressed on the side of the mountain facing the wind and thus accelerates, studies preliminary made in averages displayed hill winds 6 to 7 m / s with peaks of 10 m / s.

In terms of research, completed this project will serve to better understand the management, operation and control of micro-turbines and begin to assess the wind potential that we have in UNI Hill.

2. OBJECTIVES

a. GENERAL OBJECTIVE:

- Install a wind turbine of 5 kW and a 10 kW on the hill of the Faculty of Mechanical Engineering.

b. SPECIFIC OBJECTIVES:

- ✓ Define and justify the possible places on the hill where the wind turbines will be installed.
- ✓ Perform the foundation where the wind turbines are placed.
- ✓ Design and manufacture the wind turbine towers.
- ✓ Designing and manufacturing house control.
- ✓ Perform installation of the tower and the turbine.
- ✓ Make the connection of the wind turbine and the control house.
- ✓ To submit a report with the electrical drawings and operation of wind turbines.
- ✓ Improved aerodynamics 10kW wind turbine.

3. METHODOLOGY

The project was carried out in 4 stages:

In the first stage, it will be held in parallel with the verification of existing equipment such as controllers, inverters and wind turbines, if possible foundation generator characterization will be performed.

In the second stage the control house, which consists of manufacturing space, will be located where the control elements and protection in addition to the correct location of the same inside the house was implemented jointly design and manufacture will take place tower.

The third stage consists of the installation of the wind turbine, this means take the equipment to the area where they will be located and then perform the installation itself.

Finally, in the Final Stage connection between the turbine and the control house for further implementation will take place.

a. Deliverables

1. Plans foundation and location of wind turbines.
2. Report of operational testing and validation of existing equipment.
3. Conceptual design and manufacturing of the tower.
4. Conceptual design and manufacturing house control, this includes the electrical drawings of the control system.
5. Installation of the turbine.
6. Startup.
7. Improvement of accessibility to the turbines (optional).
8. Final Project Report and guidelines for the management of the control equipment.

4. PRESENT PROJECT PROGRESS

Table No. 1: Progress of the project.

Results	Percentage feed
Define the location of wind turbines	50%
Ground Survey and foundations	5%
Tower design	60%
Tower manufacturing	0%
House control design	30%
House manufacturing control	0%
Test operation of existing equipment	40%
Wind turbine assembly	0%
Connection between house control and wind turbine	0%
Startup	0%
Final report and guide operation	0%

5. DETAILS OF PRESENT PROGRESS

a. DEFINING THE LOCATION OF WIND TURBINES

It is aware that two wind turbines installed on the hill of the FIM by this is that it has some information about possible places with better wind potential than others do. On the other side, they are being carried recognizing areas where wind turbines could be placed considering the available area as it is to place the control and power house move.

We know that for the installation of a wind turbine a meteorological one-year study is necessary at least to have an acceptable percentage of reliability in the study of the winds, this is a distribution diagram winds throughout the year and address predominant,

During the field survey have they conducted spot checks found winds of 4 m / s (two meters from the surface of measurement) that in a first possible point location and the top of the hill near the FIM have measured wind 7m / s equally to two meters of the measuring surface, it should be noted that the correct measurement should be performed at a height of at least 10 meters above the surface measurement it is why considering the risk of not having a study of the winds of at least one year can boast just that the wind potential is very promising.

Finally, the case of a project to initiate and encourage research in wind energy and given the proximity to nearby laboratories makes these points strategic location.



FIM. Highest point of the hill facing the FIM

b. STUDY OF THE LAND AND FOUNDATIONS

Once you found the possible places where wind turbines are placed proceed to measure the area of land with which we and the distances between wind turbines.

So far we have two surfaces, the first is located at a height of 40 meters with an area of 36 m² (square side 6m) at a distance of 15 meters in a wind turbine 5kW which is not yet operational; The second is located at a height of 75 meters (the highest point of the hill FIM) with an area of 64.2 m² (trapeze bases 3 and 7 and a height de12.8 m).

Significantly, on the surface of 64.2 m² winds are better with an average of 7 m / s and the actual area available is greater but becomes narrower along the ground which is why we continue to study the possibility of placing the two turbines at that point given the minimum required separation distance between turbines.

c. TOWER DESIGN

For the design of the tower was considered a height of 12m turbines used in low power, this guarantees a less turbulent wind flow due to the ground roughness.

In previous calculations of efforts in the tower has been considered a wind speed of 13 m / s and thus we obtained a minimum safety factor of 25, it should be noted that these are preliminary estimates and in turn we are considering in the future new turbines can be mounted on the tower.

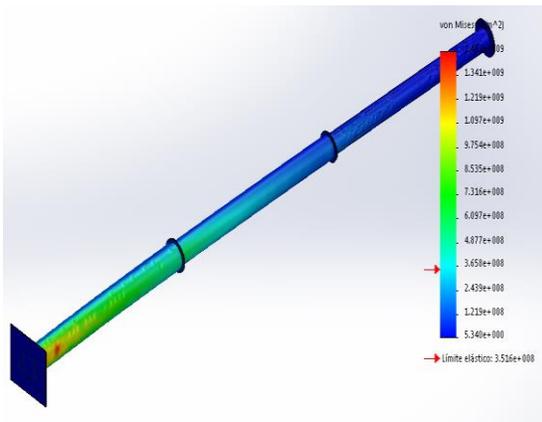


Fig 2. Simulation of efforts in the tower using the SolidWorks software

d. DESIGN HOUSE CONTROL

Has been held electrical and architectural drawings of the house of control, it's control and protection system of the wind turbine to meet.

e. OPERATING TEST OF EXISTING EQUIPMENT

The teams that are considered for this project are in the UNI over two years ago, which is why we may have suffered some damage considering this is that the decision to try each of them taken during storage and verify proper operation

Have been conducted to verify the equipment (controller, inverter, generator, shovels, sensors) initially verified visually the state of the equipment and were found in good condition most of them except the 10kW wind turbine which he met some bad cable because rodents as shown in Figure 3, on the other hand there have been test run in which two drivers are working properly.



Fig. 3. Generator 10kW in Figure the cables can be seen in disrepair.

6. CONCLUSIONS

- ✓ The proposal has been made considering the equipment with which it has, to better define the tasks and the final deliverable is essential to know the limits of project economics and time.
- ✓ The 10 kW wind turbine has a non-aerodynamic geometry this leads to the tower design more complex and more robust geometry and therefore expensive to manufacture, which is why we recommend changing the geometry of the turbine making it aerodynamic and thus facilitating the design of the tower.
- ✓ Several teams do not have information such as manuals, data sheet or operation guide this difficult work to be done and gathering information before proceeding with the test runs.
- ✓ Hill UNI has an attractive wind potential and is therefore recommending that the turbines be installed in those areas.
- ✓ Access to the hill is quite complicated is why it is recommended that an improved way to facilitate access to the turbines.

7. EXPECTED CONTRIBUTIONS

- ✓ Have a Know How in the management of small wind turbines permanent magnet, control systems and energy management.
- ✓ Encourage the use of renewable energy and research them.
- ✓ To begin the evaluation of wind potential that has the National Engineering University.

- ✓ Have a research center in Wind Energy in the vicinity of the hill FIM.

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