

Research Proposal Greg Dickson

by Greg Dickson

Submission date: 28-Oct-2024 02:58PM (UTC+0000)

Submission ID: 241189918

File name: 42256_Greg_Dickson_Research_Proposal_Greg_Dickson_596864_487753574.docx (72.98K)

Word count: 48

Character count: 327



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ELECTRICAL AND ELECTRONIC ENGINEERING INDEPENDENT PROJECT – ACCA6020

Research and
development into a
moving wind turbine
for efficiency

Project by Gregory Dickson
(2204524)

Potential supervisor:
Steve Mosey/ Gary Jones

Date: 24/10/2024

Introduction to the project

The project which is being developed will be within the field of renewable energy sources, more specifically renewable wind energy. The United Kingdom relies heavily on renewable energy sources, with wind energy generation counting for around 22.6% of the United Kingdoms energy usage in 2021 alone [1]. With the figure stated previously, it can be seen that there is an importance on the usage of renewable wind energy for the country.

Renewable energy sources are growing within the country still, the previous year of 2023 had 29.4% of the United Kingdoms energy production from wind power [2].

Background of the Project

The project aims to see if there is a more efficient way of generating wind power from what is currently available to generate the energy from the wind either having a static wind turbine or a moving turbine.

There has been an increase in the construction of wind farms both offshore and onshore, with the Welsh Government permitting planning for two new onshore wind farms [3]. There is a clear demand for the use of this type of renewable, stating the significant impact it will have on energy generation within the United Kingdom and the whole world making the project worth while researching into.

There is an interest in the use of renewables with most countries aiming for a net zero carbon emission goal within the next few decades, further increasing the demand for renewables such as wind power especially in countries such as the United Kingdom due to the nature of the environment being able to provide more energy through the means of wind power over any other type of renewable energy source currently. There could be controversy associated with the use of renewable energy sources, such as the production of the renewable energy equipment fossil fuel emissions compared to what it saves from fossil fuel emissions in the lifetime it has producing energy.

There appears to be a gap in the development into wind turbine efficiency, there are alternate ways of using a wind turbine to produce energy in different methods compared to the traditional blades such as having vertical axis blades or having down wind turbines, which face away from the direction of the wind to generate power.

The problem statement

The project aims to address is there any more efficiency of generating electricity on a static non-yaw wind turbine compared to a turbine which can change to face the wind using a yaw.

This will have research into the usage of different wind turbines and on how much power they are able to produce including the power needed to yaw a wind turbine to face the wind to generate electricity more efficiently.

Aim and objectives of the project

The overarching aim of the project is to see if wind turbines produce more energy if they face the wind with the assistance of a motor subtracting the power needed to move them to face into the wind to gain peak efficiency.

The objectives will be as follows.

The initial research will need to be completed to see what methods are used to develop wind turbines and measure the output power of the turbines when the wind is blowing at the most efficient and least efficient towards the blades of the wind turbines. This will allow further analysis to see what can be changed within the design of the turbine to improve on various aspects of it.

Next the wind turbine will need to be designed and developed with the research to assist in what the design will look like and what calculations will be needed to ensure that the aim is able to be completed. This will be a trial-and-error phase to evaluate what exactly can be done to make the proposed project realistic and what cannot be achieved.

The final objective will to be creating the project in a tangible format, this will allow a more realistic approach into evaluating if the research proposal has been meaningful and give evidence on the results acquired from the real-life testing of the final product.

Expected outcomes of the project

The project is expected to produce some significant results, there should be a shear difference between the two aspects which have been proposed to be compared to each other. This should lead the project to being a worthwhile research and development task.

At the end of the project there will be a final tangible design created with the key results comparing the two proposed comparable ideas. This will be achieved with programming, mathematical calculations and electronic design.

Project Design

The project will be a development of a small-scale wind turbine created using electronic components and programming software. This will initially need to be created in theory to ensure that the final design is to have quality assurance so less things can go wrong. Using programming and electronic design software, a mock-up prototype will be able to be made and tested within a simulation to ensure that things are mostly correctly working.

Data collection methods

The objectives will require data collection methods to complete them.

The first objective will need to be conducted using data collection methods such as peer-reviewed research reports, this will be needed due to finding out current information of the technology of wind turbines and what they are currently able to produce and to see what is available. This will allow further research into the project proposal and allow it to be developed.

The second objective will require data collection from observation, this will be the use of finding out data from the project being developed, trailed and tested. Using this method should provide information if the initial project hypothesis is correct or incorrect.

Risk management

Identifying risks is necessary in case there happens for something to go wrong. There is always a risk that the project idea could lead to injury if implemented on a real-life scale. The risks will need to be investigated further, in case something does lead to an injury.

There are also legal issues with the wind farms such as the areas which they will need to be used upon, the land will need to be approved for the wind farms to be built on.

Ethical implications

The project does lead to some ethical implications. Firstly, the issue with wind farms is the space they will take up, there will be concerns with the environment on which they will be constructed on including wildlife and any near by properties or businesses. This can be avoided somewhat by using offshore wind farms which will then have some slight ethical implications.

The second implication is the interference wind farms can have with technology such as radar systems [4]. This could potentially have fatal consequences if the wind farms are not set up correct to compensate for this issue.

Impact on the environment and society

The project should have mostly positive impacts of on the environment and society. There will be a potential gain in the energy production from wind farms leading to less use of fossil fuels making less pollution enter the atmosphere.

Secondly the environment will not have as much lasting impact as other energy creating sources meaning that there will be less of a carbon footprint being produced from the creation of the wind turbines.

And finally, society will be able to benefit from the creation of jobs and potentially less energy costs from the renewable energy sources and the efficiency of the energy being created.

Data analysis

Data will need to be gathered from the project after it has been developed and implemented. The data gathered from the project results can be compared with other data from other researched projects and also the data will be used to compare the two types of wind turbines being used within this project, being a fixed wind turbine and a moving with a yaw wind turbine.

Resources needed for the project

The project will require some resources such as programs and equipment. Programs such as CAD and proteus to simulate the electronics working will be needed, along with electronic components to construct a real-life circuit of the project. The use of C programming language will also be necessary and access to research data bases such as the library's website.

Project planning chart

<u>Project component</u>	<u>Start Date</u>	<u>End Date</u>
Initial Project idea	24/10/2024	24/10/2024
Research into the project	24/10/2024	02/01/2025
Project data collection	24/10/2024	02/01/2025
Research into ethical and legal issues	24/10/2024	02/01/2025
Simulation of the project	25/11/2024	02/01/2025
Real life building of the project	02/01/2025	25/05/2025
Final report	24/10/2024	25/05/2025

Bibliography

- [1] <https://www.greenmatch.co.uk/green-energy/wind> - Inemesit Ukpanah, March 2024
- [2] <https://www.nationalgrid.com/stories/energy-explained/how-much-uks-energy-renewable> - National Grid, January 2024
- [3] <https://www.business-live.co.uk/enterprise/go-ahead-two-major-onshore-30223486> Sion Barry, October 2024
- [4] <https://www.local.gov.uk/benefits-and-potential-impacts-wind-energy>

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GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

60/100

Intro / A&O (400 words)		
The report effectively talks about challenges in turbines, testing the wind blow by measuring the output power of the turbines. The aims and objectives are clearly defined and articulated. Clearly outlines risks and objectives; concise and effective.	20	15
Background to the Project / Literature Review (400 words)		
There is a need to review more journal papers and incorporate a detailed analysis of technical aspects. Good references, but deeper technical analysis needed.	20	11
Project Design (500 words)		
The design section could be improved by incorporating a design flowchart/ General Block Diagram, which would provide a clear visual representation of the process.	30	16

Needs flowchart/ Block Diagrams and stronger focus on more technical inputs.		
Resources / Planning (200 words)		
It is good that you have mentioned some of the risks and ethical implications but needs depth on it. The Resource planning in your report is limited. Detailed resource planning and a Gannt Chart is needed.	15	9
Document Presentation		
The document is well-organized and flows logically. However, some sections lack sufficient detail and would benefit from further development.	15	9
TOTAL	100	60

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