MILESTONE 1 (STAGE 0) – PRE-PROJECT RESEARCH MEMO

Team Number: 03

This is an individual deliverable and should be submitted by each team member **prior** to Design Studio 3.

→ Complete your pre-project research memo on the following page

At the beginning of Design Studio 3, we will be asking that you copy-and-paste the Pre-Project Research Memo below into **Milestone One Team Worksheets.** It does seem redundant, but there are valid reasons for this:

- Each team member needs to submit their Pre-Project Research Memo with the **Milestone One Individual Worksheets** document so that it can be ***graded***
- Compiling your individual work into this **Milestone One Team Worksheets** document allows you to readily access your team member's work
    - This will be especially helpful when completing ***Stage 1*** of the milestone

Please list Team Member that is submitting the memo.

Full Name: Kartik Narendra Chaudhari	MacID: 400300382

Summary of wind turbine blade technology and potential design considerations.

Each individual research memo should be ***no more than one page***, excluding references.

Introduction:
Wind energy technologies may have a very significant role in the future as part of a diverse portfolio of renewable energy resources supplying cities. There are no emissions produced during operation of wind turbines and large-scale wind energy is already economically reasonable with many conventional sources of energy. While wind turbines do deliver emanations over their life cycles, by dislodging matrix sourced power created from fossil fuels, profitable frameworks can have carbon payback periods of a year or less. Wind energy is dependent on strong and consistent winds, which can be more challenging within cities. Buildings and other obstructions distort wind flows and may result in turbulence, which can reduce turbine energy output and cause materials fatigue. The projects which are sited at the wrong places will not be cost-effective and will have long energy and carbon payback periods. As a result, it is important that turbines be sited in open areas or well above nearby structures to increase their access to high-quality wind. [1] The speed of the wind largely determines the amount of electricity generated by a turbine. Higher wind speeds generate more power because stronger winds allow the blades to rotate faster. Faster rotation translates to more mechanical power and more electrical power from the generator. [2]

Design factors:
The design of a wind turbine varies depending on the site where it will be located, cost of manufacture, the resources available, and many other factors. The ideal design allows the wind turbine to capture the most energy possible from the wind. [3] Turbines are designed to function within a specific range of wind speeds. The limits of the range are known as the cut-in speed and cut-out speed. They are designed to maximize the rotor blade radius to maximize power output. Larger blades allow the turbine to capture more of the kinetic energy of the wind by moving more air through the rotors. However, larger blades require more space and higher wind speeds to operate. As a general rule, turbines are spaced out at four times the rotor diameter. This distance is essential to avoid interference between turbines, which decreases the power output. [2] A wind turbine involves of three main parts: the tower, the nacelle, and the rotor blades. The tower is either a steel lattice tower similar to electrical towers or a steel tubular tower with an inside ladder to the nacelle. Wind turbines also include a utility box, which converts the wind energy into electricity that is situated at the base of the tower. Various cables join the utility box to the nacelle, while others

link the whole turbine to nearby turbines and to a transformer. [4]

References (adhere to IEEE notation)

***references do not count toward word count / page limit

[1] M.A. Hyams, “Wind energy in the built environment”,Wind Energy Technology, [Online], Available: https://www.sciencedirect.com/topics/engineering/wind-energy-technolo [Accessed September 23, 2020]
[2] J.M.K.C. Donev et al. (2020). Energy Education - Wind power [Online]. Available: https://energyeducation.ca/encyclopedia/Wind_power
[Accessed: September 24, 2020].
[3] Kate Miller-Wilson, Design of a Wind turbine, Love to Know Green Living [Online] Available: https://greenliving.lovetoknow.com/Design_of_a_Wind_Turbine [Accessed: September 24, 2020]
[4] Wind Turbines, How Products are Made [Online] Available: http://www.madehow.com/Volume-1/Wind-Turbine.html [Accessed: September 23,2020]

MILESTONE 1 (STAGE 1) – INITIAL PROBLEM STATEMENT

Please complete this worksheet in your corresponding team document.

MILESTONE 1 (STAGE 2) – PRELIMINARY OBJECTIVE TREE

Team Number:	03

This is an individual deliverable each team member will complete ***during*** Design Studio 3.

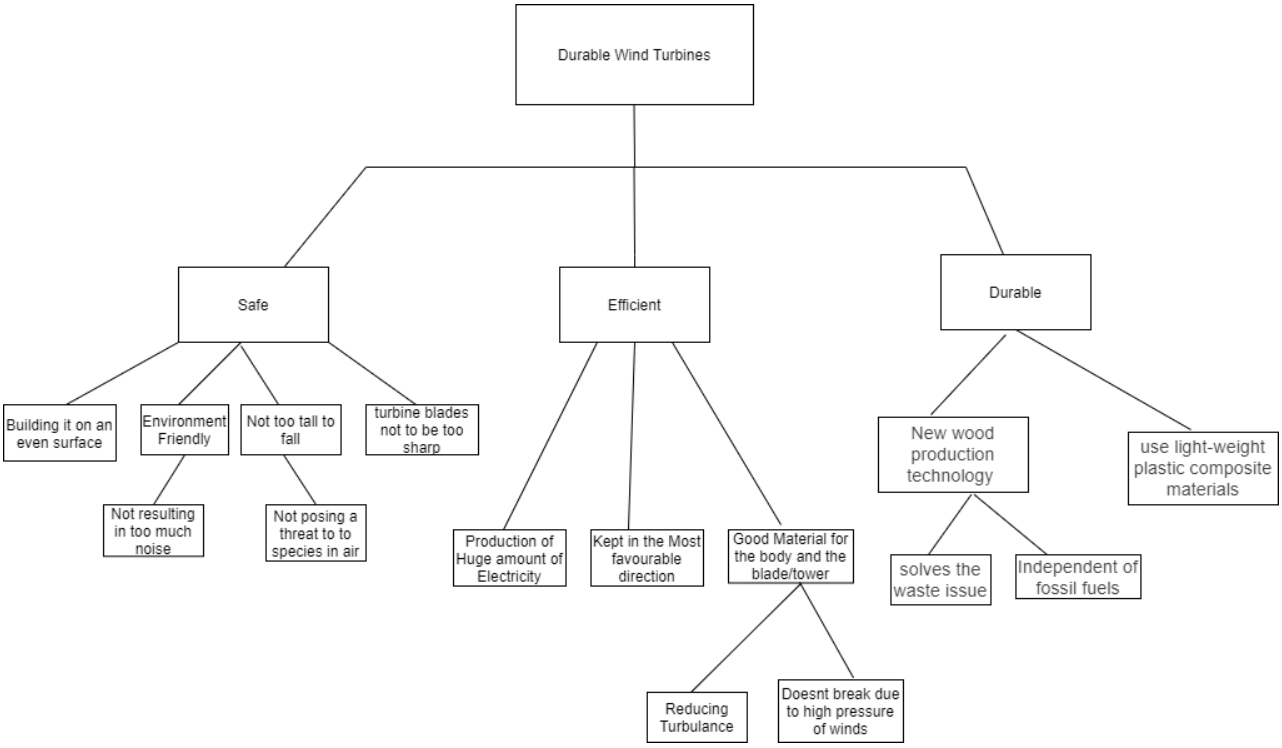
→ Review the 4 different engineering scenarios outlined in the Project 1 module

→ The Project **Manager** will assign each team member one scenario

→ Complete a preliminary objective tree for your assigned scenario on the following page

Name: Kartik Chaudhari	MacID: 400300380
Engineering Scenario #:	#1
Enter title of assigned scenario Renewable Energy for Large Population	
Insert individual preliminary objective tree diagram for assigned scenario in the space below	

MILESTONE 1 (STAGE 3) – REFINED OBJECTIVE TREE



Please complete this worksheet in your corresponding team document.