Wind Turbines
Learning Standards

Specific Standards

- *ETS1 Engineering Design (6.MS-ETS1-1):* Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution. Include potential impacts on people and the natural environment that may limit possible solutions.*
- *ETS1 Engineering Design (6.MS-ETS1-5(MA)):* Create visual representations of solutions to a design problem. Accurately interpret and apply scale and proportion to visual representations.*
- *ETS1 Engineering Design (6.MS-ETS1-6(MA)):* Communicate a design solution to an intended user, including design features and limitations of the solution.
- *ETS2 Materials, Tools, and Manufacturing (6.MS-ETS2-2(MA)):* Given a design task, select appropriate materials based on specific properties needed in the construction of a solution.*

Engineering Design Process

Identify a need or a problem. To begin engineering design, a need or problem must be identified that that one can build something to solve or improve. This typically includes articulation of criteria and constraints that will define a successful solution.

Research. Research is done to learn more about the identified need or problem and potential solution strategies.

Brainstorm and Design. All gathered information is used to brainstorm as many possible solutions as possible. Considering the criteria and constraints, a final design is chosen for prototyping. Design includes modeling possible solutions, refining models, and choosing the model(s) that best meets the original need or problem.

Prototype. A prototype is constructed based on the design model(s) and used to test the proposed solution. A prototype can be a physical, computer, mathematical, or conceptual instantiation of the model that can be manipulated and tested.

Test and evaluate. The feasibility and efficiency of the prototype must be tested and evaluated relative to the problem criteria and constraints. This includes the development of a method of testing and a system of evaluating the prototype's performance. Evaluation includes drawing on mathematical and scientific concepts, brainstorming possible solutions, testing and critiquing models, and refining the need or problem. Depending on how well the prototype performs, a redesign may be necessary.

Share and respond to feedback. Communicating, explaining, and sharing the solution and design is essential to conveying how it works and does (or does not), solving the identified need or problem, and meeting the criteria and constraints. Communication of explanations must be clear and analytical. Feedback through oral or written comments provides constructive criticism to improve a solution and design. Feedback can be asked for and/or given at any point during engineering design. Determining how to communicate and act on feedback is critical.