

# Water vs. Wind

## Which Makes More Electricity?

Katherine Johnson  
Stonegate Elementary  
Zionsville, IN

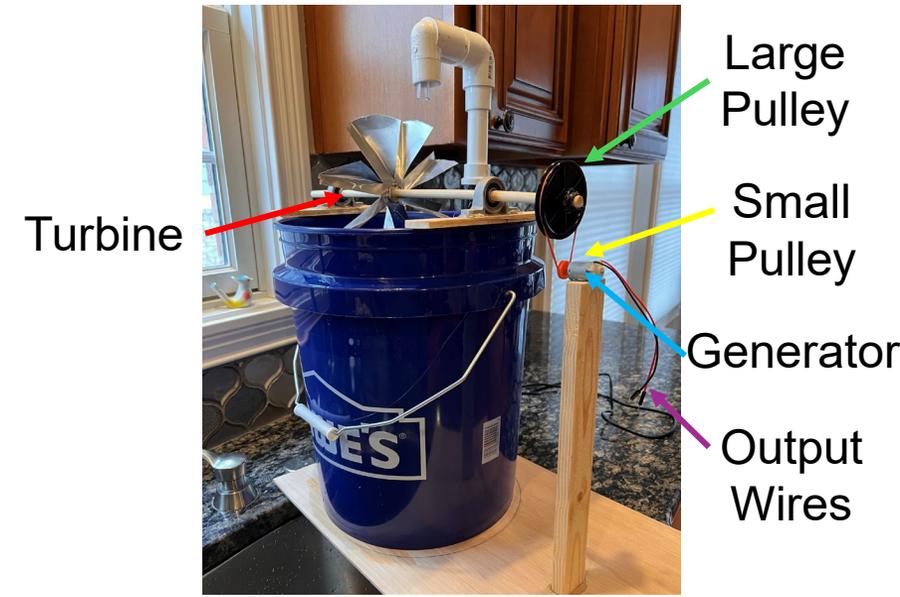


# Purpose, Question, & Hypothesis

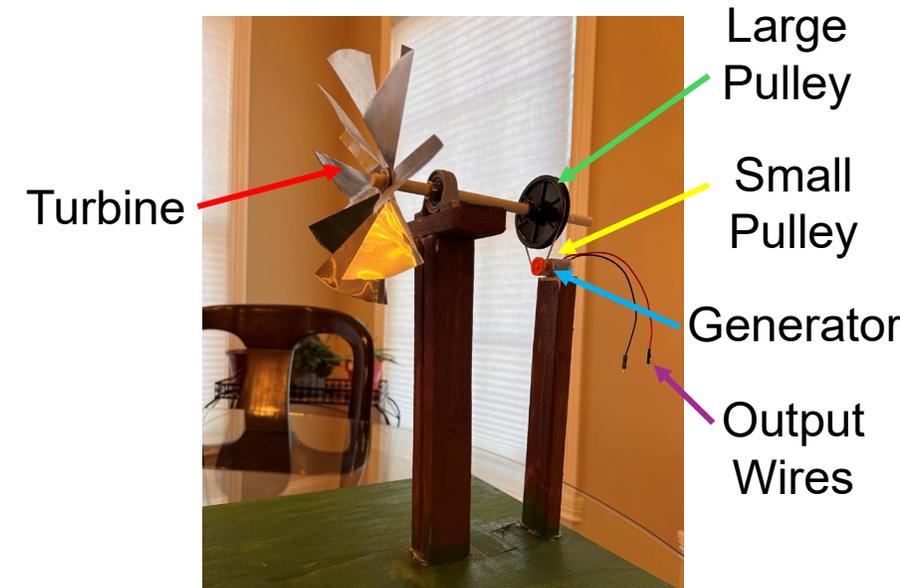
- Fossil fuels used to make electricity make greenhouse gases that cause the Earth to get warmer. Water and wind are clean, renewable energy sources that can reduce greenhouse gases.
- Will a water turbine or wind turbine make more electricity?
  - I built water and wind turbines to measure the electricity produced when the power source was the same, 15W.
- I believe that the water turbine will create more electricity than wind turbine.

# Experimental Design

- I built a water turbine to capture the kinetic energy of flowing water and a wind turbine to capture the kinetic energy of wind.
  - I used a 15W water pump to flow water onto the water turbine and a 15W fan to blow air onto the wind turbine to make each spin.
  - The turbines and large pulleys were connected to a shaft that turned when the sources hit the turbines.
  - I used a rubber band to connect the large pulleys to the small pulleys connected to generators to make the generators' shafts spin.
- The spinning generators' shafts made electricity. I measured the maximum electrical output with a multimeter attached to the output wires. I measured in millivolts (mV).



Water Turbine



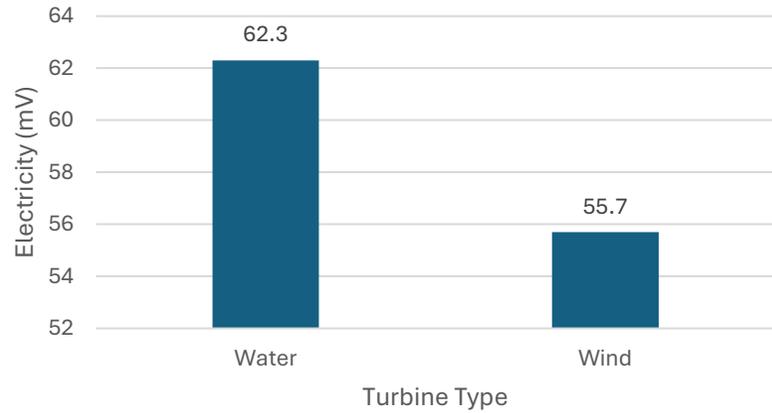
Wind Turbine

# Project Variables

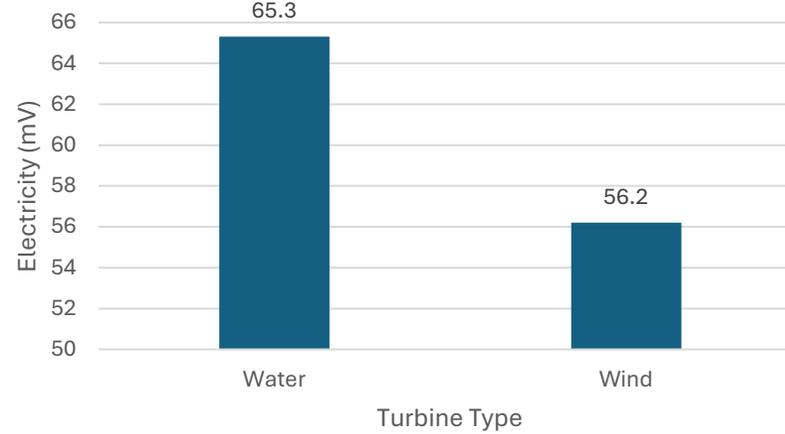
- To get the best results, I designed the turbines to be the same materials and design. I also made the power inputs the same. I used only one multimeter to gather the data from both turbines.
- Controlled Variables
  - Power Input for Water and Wind, 15W
  - Turbine Material and Design
  - Generator System
- Independent Variable
  - Renewable, Clean Energy Source
    - Water
    - Wind

# Results from 5 Trials

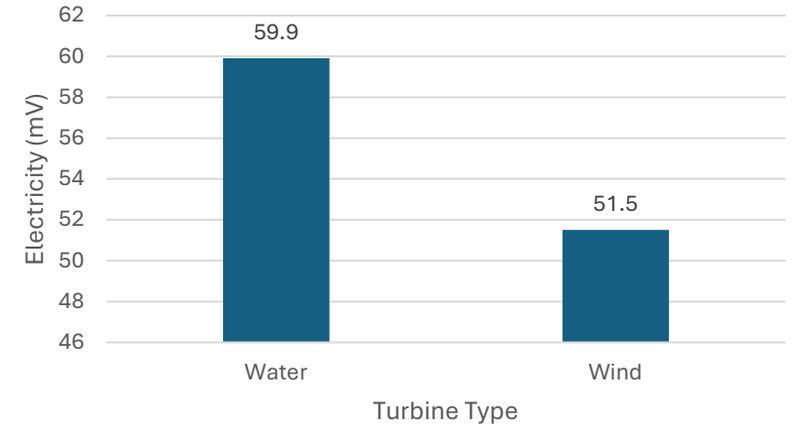
Turbine Test 1



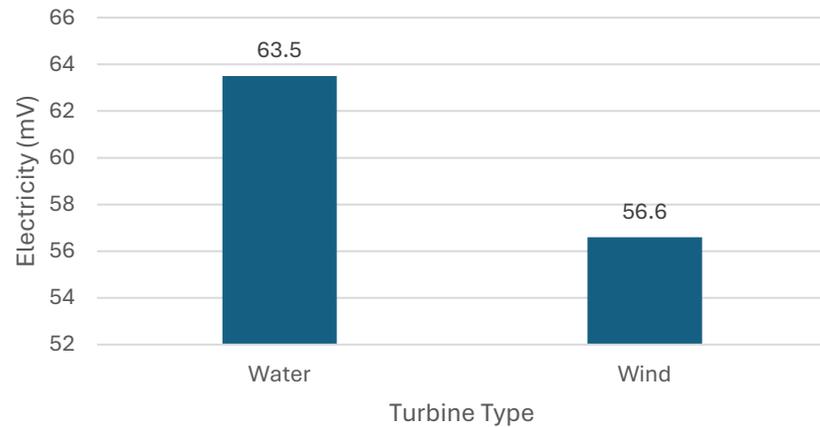
Turbine Test 2



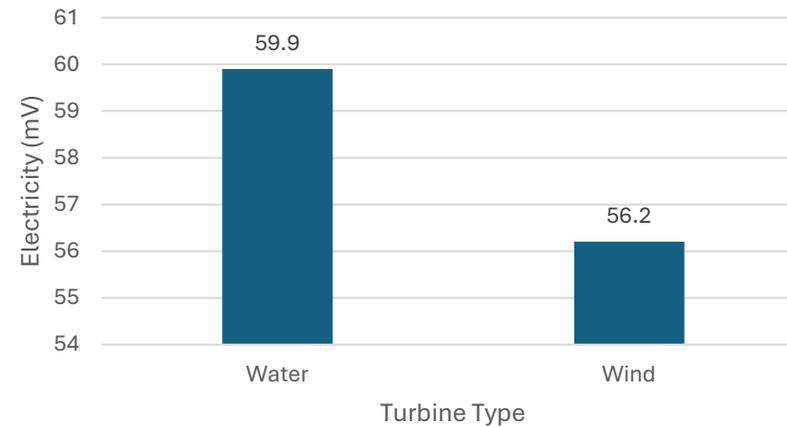
Turbine Test 3



Turbine Test 4

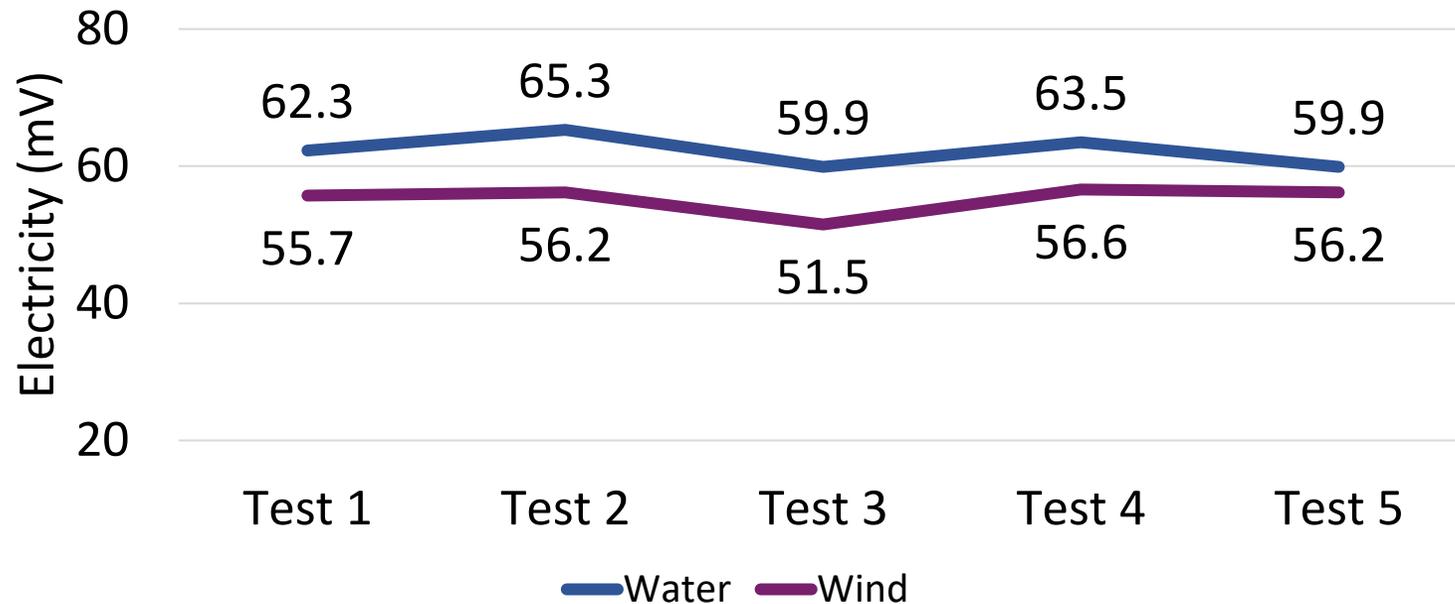


Turbine Test 5



# Results

## Maximum Electricity from Turbines



Graph produced by Katherine Johnson using Microsoft Excel LTSC MSO

The multimeter recorded the voltage output over a 2 minute period. The maximum voltage from the generators for each trial showed that the water turbine voltage was higher in each trial.

# Data Analysis

- During each of the 5 trials, the water turbine always had a higher maximum voltage over the 2 minute period than the wind turbine.
- The average water turbine electrical output was 62.2 mV.
- The average wind turbine electrical output was 55.2 mV.
- The results show that the water turbine's average maximum voltage was 6.9 mV higher than the wind turbine.

# Conclusions

- The 15W power sources moved water and air to create kinetic energy.
- The turbines' design captured the kinetic energy and made electricity from both sources.
- My hypothesis was correct that water would make more electricity.
  - The mass of water is more than air.
  - The heavier water had more kinetic energy and caused the turbine to spin faster.
  - The faster the generator turbine spins, the more electricity is made.
- Water turbines make more electricity than wind turbines and will contribute more to the reduction of fossil fuels.

# Next Steps

- Water creates more electricity but is not widely used. Only 3% of the dams in the US are used to produce energy. Converting existing dams used for irrigation and flood control to produce power would generate more electricity with minimal impact on the environment.
- Clean, renewable energy sources, such as water and wind, have great potential to help reduce pollution and reduce dependence on fossil fuels.
  - We need a combination of different sources to achieve this goal.
- What Would I Change?
  - Design the system to eliminate the pulleys and connect the generator directly to the turbine.
  - Optimize the turbine design for each source (i.e. make the wind turbine bigger in diameter, change the blade design)
  - Add a comparison to solar power with a 15W lightbulb or 15W solar panel. Look at the efficiency of each source.

## Bibliographic References

- Brearley, Laurie (2018). *Water Power: Energy from Rivers, Waves, and Tides*.
- Corso, Phil (2021). *How Does Electricity Work?*.
- Dickmann, Nancy (2023). *Energy*.
- Doeden, Matt (2015). *Finding Out about Hydropower*.
- Doeden, Matt (2015). *Finding Out about Wind Energy*.
- Graf, Mike (2009). *How Does a Waterfall Become Electricity*.
- Howell, Izzi (2020). *Energy Eco Facts*.
- “How to Make a Wind Turbine.” YouTube, uploaded by Science Max, March 25, 2025.
- “How to Make Power Generator.” YouTube, uploaded by Creative Crafts, October 20, 2019.
- Hunter, Charlotte (2017). *Windmills*.
- “Hydroelectric Generator.” YouTube, uploaded by Pareshum, February 22, 2014.
- “Hydro Electric Science Fair Project- Part of the 2015 Google Science Fair promo.” YouTube, uploaded by Jeff Drugmand, January 29, 2012.
- Hydropower vs Wind Power- [https://www.all-science-fair-projects.com/project1393\\_details.html](https://www.all-science-fair-projects.com/project1393_details.html)
- Jacobson, Ryan (2022). *How Do Wind Turbines Work?*.
- Jacoby, Jenny (2024). *Electrical Engineering*.
- Mihaly, Christy (2022). *Energy from Water*.
- Mikoley, Kate (2021). *How Do Wind Turbines Work?*
- Science Buddies Staff. "Put Your Water to Work: Using Hydropower to Lift a Load." *Science Buddies*, 22 June 2021, [https://www.sciencebuddies.org/science-fair-projects/project-ideas/Energy\\_p021/energy-power/using-hydropower-to-lift-a-load](https://www.sciencebuddies.org/science-fair-projects/project-ideas/Energy_p021/energy-power/using-hydropower-to-lift-a-load). Accessed 6 Jan. 2026.
- Ziem, Matthew (2018). *Wind Power: Sailboats, Windmills, and Wind Turbines*.