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Project: Build a Wind Farm

The need to pump water for human consumption and irrigation is critical in rural communities all over the globe. Many times this is accomplished using diesel pumps that have a number of challenges.

"The most common technology for off-grid communities, diesel engine pump sets, is also the least sustainable. Diesel engines are attractive to infrastructure developers and donors because they are inexpensive to purchase and they are widely available; but they are also heavy polluters, can be expensive to operate, and their reliability is sensitive to proper operations and regular maintenance. Fuel availability is seldom a problem but the support infrastructure for diesel pumps commonly breaks down, leaving users without safe water for long periods. It is amazing how often diesel pumps are automatically employed in development projects in spite of the overwhelming evidence that they have poor sustainability." [1]

In this project, you will design a *wind farm*, a collection of wind turbines grouped together to create a single wind power plant. The wind farm you design will provide electricity to one or more KidWind Small Water Pumps with the goal of moving as much water as you can, as high as possible. The more power you provide to the pump, the more water you can move and the higher the pressure you can create. During the project, you will work with your group to design, test, and then optimize the orientation and design of your wind farm. At the end of the project, you will submit the set of deliverables.

DESIGN REQUIREMENTS AND CONSTRAINTS

- Construct a system that pumps water between two reservoirs
- Must be able to vary the height between the two reservoirs
- Must power the system using a KidWind turbine
- Must use the KidWind Small Water Pump
- Can use multiple turbines (minimum 2, maximum determined by your instructor)
- Can use multiple pumps (between 1 and 3 pumps)
- Construction materials must be readily available (recycled materials are encouraged)
- Do not exceed the project budget

DELIVERABLES

- Detailed system specifications (so the unit can be replicated exactly)
- Volume of water pumped between two containers in five minutes
- Height distance between the two containers where water was pumped
- Wind speed used to drive turbines
- How much water your system could move in 24 hours based on your best setup
- Social and environmental impact statement on the benefit of your design

[1] Source: Excerpt from *Wind-Electric Pumping Systems for Communities*
http://bergey.com/wind-school/articles/wind-electric-pumping-systems-for-communities-2

Vernier Lab Safety Instructions Disclaimer

THIS IS AN EVALUATION COPY OF THE VERNIER STUDENT LAB.

This copy does not include:

- **Safety information**
- **Essential instructor background information**
- **NGSS alignment information**
- **Important tips for successfully doing these labs**

The complete *Renewable Energy with Vernier* lab manual includes 26 labs and essential teacher information. The full lab book is available for purchase at:
http://www.vernier.com/products/books/rev/

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