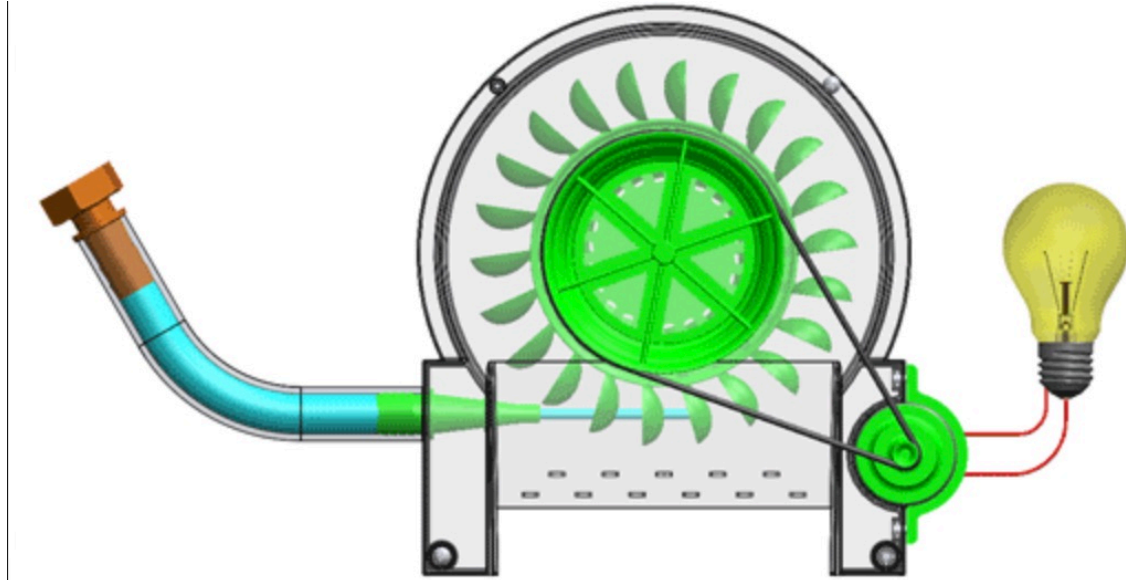


## JPEC 2019: Generator



The objective is to make as much electrical energy as possible over a 30 second test using a hand-made generator/turbine and a 5 gallon pail of water which is positioned 10 metres above ground level.

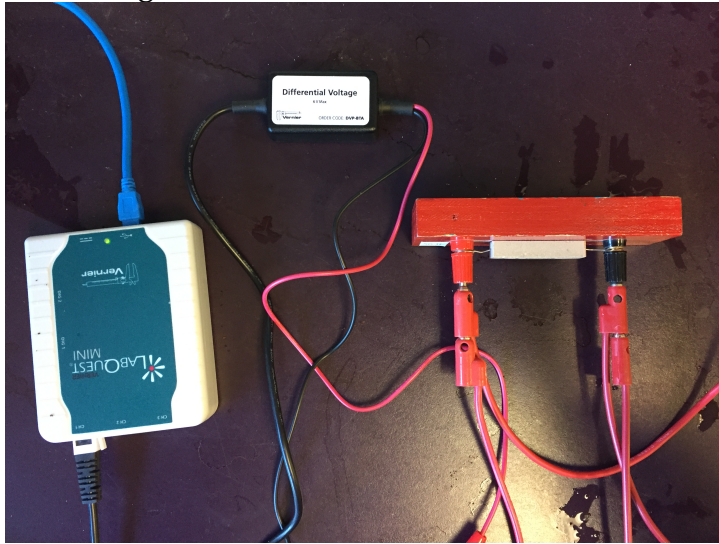
### The generator:

Wire coils must be wound by hand. If the coil is mounted on a spool, then the spool must be a common household object, like a TP roll or a juice bottle. The axle of the turbine/generator is to be made from wooden dowel material. The rest of the components including the turbine blades can be purchased from hardware/hobby stores or harvested from toys or other projects. 3-D printing of these remaining components is allowed. The generator must have two exposed wire leads to connect to the measurement system. For the test, the generator will be placed inside a large tub to capture the water flow from the pail. The generator, including the turbine blades must fit entirely within the tub so that the lid closes on the test-ready generator. The tub is a Home Depot 102L storage bin: <https://www.homedepot.ca/en/home/p.102-l-strong-box-tote-with-locking-in-blackyellow.1000706729.html>

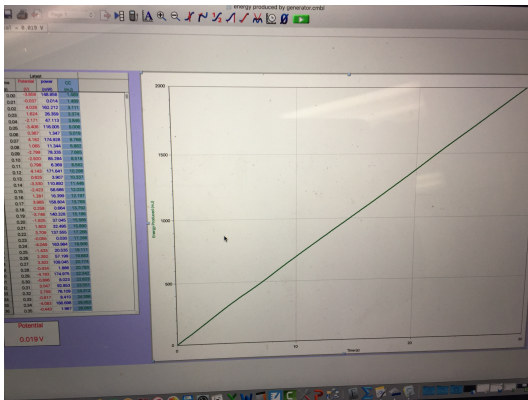
### The water:

Comes from a 5 gallon pail placed 10m above ground level. The only source of energy to turn the generator is to come from the water in the pail. Only one pailful is to be used for each test. A hose bib is affixed to the base of the pail and a 25' garden hose brings the water to ground level. Teams are to supply their own female connection to the male end of this garden hose, and connect this in some way to their generator. Teams are to turn on the water flow (using a valve provided at ground level, at the end of the hose) at the start of the test, and then lightly tap a computer keyboard to begin the test. Energy production data for the generator will be measured starting from the tap of the keyboard for a total of 30 seconds.

The test rig:



The leads from the generator will be connected to the test rig which consists of a 100 ohm ceramic resistor and a voltage probe. Connection will be via alligator clips which are provided. Students will make the connection and are responsible for ensuring that bare conductor is present to make a good electrical connection. From the voltage reading by the probe the instantaneous power is computed ( $V^2/R$ ) and the cumulative energy production is tabulated for 30 seconds and graphed. The voltage probe is a Vernier 10V with a 3.1millivolt resolution.



Teams will have two trials and the better result will count. Teams will have 5 minutes between trials to make adjustments to their project.

The judges reserve the right to veto any design that they deem counter to the spirit of the rules and their decisions will be final. Please ask *in advance* for clarification or adjudication in order to avoid disappointment on event day.