SCENARIO
Your team has been employed as consultants by a leading engineering firm to design and build a replacement turbine to be used in the power stations at the Snowy Mountains Hydro-Electric Scheme.

AIM
The aim of this half-day activity is to design and build a model water turbine that will generate the greatest amount of power as water flows over it.

WHAT TO DO
Your team needs to construct a simple, robust and efficient turbine from a fixed quantity of masking tape, wooden sticks, and polystyrene. Masking tape will be dispensed by the Activity Personnel. A ruler and scissors are provided to use as tools for your construction. You will receive a reusable aluminium axle for the turbine to be mounted so it can be fitted into the test rig where water will flow through it.

**Vertical Turbine**
(Spins on a vertical plane)
Water wheel-style design

**TIMETABLE**

<table>
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<th>Session (1h 45m)</th>
<th>Half Day Activity</th>
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<td>Following a 5-minute briefing there will be 45 minutes to design and build a turbine before testing begins. Testing will run during the next 50 minutes, with the last 5 minutes left for pack up.</td>
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RULES
The turbine must be firmly attached to the axle provided.
An axle hole-cutter is provided but must be used with the cutting block.
One team member is responsible for fitting the completed turbine into the test rig and adjusting placement of the water source.
The axle can only be fitted into the cradle on the right side of the test rig first. Ensure both ends of the axle sit securely on the cradles. Once the turbine has been positioned, it cannot be touched whilst the test is being conducted.
Only the Activity Personnel may operate the test rig.

SCORING
Each team’s turbine is placed into a special rig where water will flow through it. The display unit attached to the test rig automatically determines the score for each test by calculating the average number of revolutions as it spins over time.
The duration of each test is 20 seconds. Teams may have multiple attempts, subject to the timing constraints of the activity.
In order to receive a score, the reusable axle must be separated from the turbine and returned to the Activity Personnel at the conclusion of testing.

⚠ At the end, ensure your team’s score sheet is with the Activity Personnel.

TIPS
The diameter of the axle is 25 mm. There is a hole cutter provided which will allow you to quickly cut the right sized hole for the axle to fit through. Make sure the turbine fits onto the axle and spins without wobbling or vibrating.
The maximum diameter of the test rig is 145 mm. Your turbine must be smaller than this to fit in the rig and be tested. Use the table stands to test whether your turbine can spin freely.
Carefully select the materials you use and the method of attachment so that the turbine is not damaged by the water and efficiently converts the water’s flow into power.
Where the water starts to flow over the turbine can affect how much power it can transfer. Experiment to find the optimum position for the turbine and the placement and angle of the hose along the slider.
It is important to test and improve your design as soon as possible to ensure your team records at least one successful result during official testing.
You can press the thin side of your ruler into the polystyrene to make an indent. Folding along indents you make should allow you to nicely break off pieces of polystyrene without any cutting.