Power Challenge
Improve

Video transcript
E hoa mā! Your turbines are looking pretty powerful. But there's still one last thing to do – supercharge your turbine to light up your entire town. You can't get out more energy than what you are putting in. This means, the better your turbine works, the more lights will switch on. So your turbine will need to be aerodynamic, fast, smooth, steady and strong to beat the final challenge. And we're here to help you achieve that.
To start, you're going to follow the final stage of the engineering design process – improve! This stage is about using all of your knowledge and data to make your turbine even better. So, what does your challenge data tell you? What have you learned so far that you could apply to your turbine? Is there anything new you could learn? We think we have something that might help!
And that thing is "torque"! Torque is the twisting power that makes turbine blades rotate. It's what decides how fast your turbine spins, and how much wind it needs to start spinning. Too much torque means the turbine can spin in low winds, but doesn't spin very fast. And not enough means the turbine needs more wind to spin, but can spin faster.
Picture your turbine… Is it easier to spin the blades by pushing at the end, or near the hub? At the end, right? That easiness or hardness of turning is torque.
And that comes down to your blade design variables!

Commented [SP1]: Could tighten this:
But there's still on last thing to do - supercharge your turbine so you can light up your entire town. It'll need to be aerodynamic, fast, smooth, steady and strong.

Commented [SP2]: The link to the next section feels a bit off here. Maybe introduce torque by something like, "Here's a tip - torque will decide how fast your turbine spins, and how much wind it needs to start spinning."

Then go on to explaining torque so they know what concept the learning is connecting to upfront.

Blade design variable tuatahi: Length If you have long blades, the wind doesn't have to try as hard to turn them. And that's because it's hitting them further away from the hub, just like my last example. Buuut shorter blades can spin faster because they create less drag force.
Blade design variable tuarua: Width Wider blades catch more wind, which can give you more torque to start. But make them too wide, and drag force becomes more powerful! Back again to sabotage your turbine.
Blade design variable tuatoru: Number of blades Less blades means lower torque but higher speed. And more blades means higher torque but lower speed.
Blade design variable tuawhā: Materials Blade materials should be strong and not too flexible so the blades don't bend in the wind. But, they also need to be light enough to spin.
And finally, blade design variable tuarima: Shape Your blade shape has a big impact on lift and drag. Is there anything you can do to your blade shape to power-up lift?
Right, I think that's enough from us! Now it's time to use whatever knowledge and data is most helpful to you, to supercharge your turbine. Good luck, and charge on.