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Inspiring the next generation

ANIMATION SCRIPT

CAN WE HARNESS THE POWER OF THE OCEANS?

PROFESSOR JENNIFER FRANCK

TO MAKE THE MOST OUT OF THIS SCRIPT, YOU COULD:

- Stick it in your book as a record of watching Jennifer's animation
- Pause the animation and make notes as you go
- Add your own illustrations to the sheet
- Create your own animation to accompany it
- Add notes from classroom discussions
- Make notes of areas you will investigate further
- Make notes of key words and definitions
- Add questions you would like answered – you can message Jennifer through the comments box at the bottom of her article: **www.futurumcareers.com/can-we-harness-the-power-of-the-oceans**

SCRIPT:

In 2020, 85% of energy used around the world came from coal, oil and gas. These fossil fuels are not renewable, and their use is causing climate change through the release of carbon dioxide, so it is crucial that we shift to different sources of energy.

Wind turbines and solar panels now make up around 5% of the US's energy mix. The wind and sun are both renewable and capturing their energy does not release carbon dioxide into the atmosphere.

However, though wind and solar power technologies are becoming cheaper and more widely available, wind and solar power rely on unpredictable weather conditions. Only using these sources would require enormous energy reserves to maintain consistent supplies.

Storing energy is not easy, which is why tidal power is appealing. Every 12 hours and 25 minutes, without fail, tides go up and down.

Professor Jennifer Franck, a mechanical engineer at the University of Wisconsin-Madison in the US, is developing technology that could enable us to harness this power.

Moving water is available in many high-density locations (such as in rivers or tidal channels near big cities) and also remote locations (where island or Indigenous communities are not reliably connected to an electric grid).

The task for engineers like Jennifer is to find an efficient way to capture the movement of water. Previous attempts operate on the same basic principles as wind turbines, but the problem is that rotational devices spin very fast, which can cause seaweed or fishing lines to get tangled in them and could have adverse effects on wildlife.

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Jennifer and her team are working on a device that includes a hydrofoil that rises and falls like the end of a seesaw as water flows past it. The hydrofoil has a surface which it fixes at an angle (known as the angle of attack) compared to the direction the water is flowing in, so that it is pushed up towards the surface. When it reaches the top of its oscillation, the hydrofoil switches its angle of attack so the flow of water now pushes it back down again, until it reaches the bottom, switches angle again and repeats the cycle.

Computers are vital in Jennifer's work because the physics equations that describe the motion of fluids are complicated and usually impossible to solve by hand. Jennifer uses computer simulations to predict how much power a certain design could generate.

Jennifer and her collaborators have built prototypes and tested them in the lab and in the sea. Their experiments show their device can work for a wide range of tidal flow speeds in both directions. The team has also discovered that positioning one oscillating hydrofoil behind another can create a whirlpool to power the second.

Each discovery like this gets us closer to realising the potential of marine energy.

What could you achieve in the field of mechanical engineering?