Planet Warriors – Geothermal Energy

Bryce: Welcome back to Planet Warriors, the podcast where we power up our brains and plug into the facts about energy and the incredible ways kids like you can help our planet thrive. And along the way, get to meet the band of super connected superheroes powering the path to a brighter future. I'm Bryce Corbett, and today we're turning up the heat. We're diving deep underground, tapping into the Earth's inner fire and unearthing the sizzling science of geothermal energy.

Now imagine a giant power plant that's been running non-stop for billions of years hidden beneath your feet. No added fuel needed. No smoke. Just the steady heat of the earth itself. From boiling geysers to steaming volcanic vents, this underground energy source is cleaner than coal and bubbling with potential.

And what if I told you that we could turn that heat into electricity? Yep. Power from the planet itself. Time to dig a little deeper. With a little help from today's guest, another member of the Planet Warriors super connected superhero crew.

Rocky: Boom! Crack steam and sizzling stone. It's rocky here. Your underground guide to all things hot and happening beneath the Earth's crust. Are you ready to get cooking?

Bryce: You're damn straight we are. Rocky, help us out. What is geothermal energy?

Rocky: It's simple. Really. Geo means earth. Thermal means heat. So geothermal equals heat from the Earth. Our planet is like a giant layer cake with molten filling. Molten rock is just a fancy word for rock that is so hot it's part liquid.

Deep underground, it's incredibly hot. Thanks to leftover heat from when the Earth was formed and from radioactive materials breaking down. Sometimes that heat rises to the surface, like in geysers.

Whoa!

Or hot springs. But with the right tools, we can go underground and bring that heat up to power generators.

Bryce: Wow.

Rocky: That's geothermal energy.

Bryce: Amazing. So we're basically tapping into nature's very own slow cooker.

Rocky: Exactly. And it never runs out. The earth's been cooking for four point five billion years, and it's not stopping anytime soon.

Unbelievable. So, Rocky, how do we actually catch that underground heat and turn it into something useful.

Rocky: Here's the recipe. Drilled deep into the earth where it's super-hot, we can pump cold water down through the pipes. The water heats up and turns into steam. The steam races back up, spins a turbine and boom! Electricity. It's kind of like a geothermal teapot, just underground and a whole lot bigger.

Bryce: Whoa! So volcanoes equal potential power plants?

Rocky: Sort of. We look for special spots called geothermal reservoirs. And while volcanoes are exciting, geothermal energy can be tapped even in cooler areas using new technology called enhanced Geothermal Systems. Australia is working on that right now.

Bryce: Now, Rocky, I've heard a few hot takes that made me pause. Like geothermal energy causes earthquakes or it's too expensive and only works near volcanoes.

Rocky: Yeah, I've seen those too. And at first I felt kind of nervous, like, whoa, are we cracking the earth open too much? Big feelings. Right?

Bryce: Totally. And big feelings are often a sign that we need to check the facts. So let's bring in someone who really knows their underground onions.

Rocky: Time to meet the expert. Joining us now is Professor Kathryn Amos, Chair in GeoEnergy at the University of Adelaide. Now she studies the Earth's underground

heat and how we can use it safely and smartly. Professor Amos, welcome to Planet Warriors.

Professor Amos: Thank you for having me.

Bryce: You're very welcome. Now, can you tell us what your job is and how it connects to geothermal energy?

Professor Amos: I sure can. So, I'm an earth scientist, and I'm interested in the properties of rocks really deep below the surface of the Earth.

Bryce: Wow.

Professor Amos: So I conduct scientific investigations to study rocks deep beneath the ground. I look at rocks in cliff outcrops. I even sometimes do experimental models like big fish tanks and sand pits, which all help us to understand more about the geological past of Earth and the properties of rocks really deep below the surface.

Bryce: So when you say deep below the surface, how far are we talking?

Professor Amos: So the rocks I'm interested in are in the crust. And I'm really thinking maybe like five to ten kilometres beneath the surface. So it's pretty deep, but it's just the surface of the Earth.

Bryce: Wow. And how warm does it get ten kilometres beneath the surface of the Earth?

Professor Amos: Oh, that's a really good question. It depends on where you are. So we've got different parts of Earth's surface that get hotter than other parts. So some places, like where there's volcanoes, it's much hotter near the surface. And some of your listeners might have even been to a hot springs. There are a few hot springs in Australia.

Bryce: Yeah.

Professor Amos: And then there's other parts of the Earth's surface where it's not that hot. But if you start going down, because the middle of the Earth is a big ball of melted rock.

Bryce: Whoa!

Professor Amos: And it's incredibly hot, so as we go down, it gets hotter wherever we are. And some places where it's really hot in Australia, for every one kilometre we go down, the temperature might rise by fifty or one hundred degrees C.

Bryce: Whoa!

Professor Amos: It's quite a lot.

Bryce: That's amazing. But the exciting thing is that we can use this heat to generate energy and electricity, to run our houses and all the bits and bobs that we require.

Professor Amos: We absolutely can. And we can use the Earth's heat in different ways. So, some of the ways we can use that are to generate electricity like you've just mentioned. And then some of the other ways are to bring up some of that warm water from below, deep below the ground from, we call it from hot rocks, and we can bring that up and we can use it to do things like heat buildings and houses as well.

Bryce: Wow. Unbelievable. Now, professor, some people worry that drilling for geothermal energy could cause earthquakes. What does the science say on that?

Professor Amos: Yeah, so the science says it's true.

Bryce: Wow.

Professor Amos: Geothermal energy processes does cause earthquakes.

They're really, really small ones, and they're not anything we need to worry about.

Bryce: Phew. So small that you wouldn't even feel them?

Professor Amos: Mostly, not. Sometimes it's possible. Usually there's thousands of them, and they're so small we need really precise scientific monitoring equipment to be able to even know that they're happening. But I can reassure everybody that when projects are being looked at for geothermal energy, there's a lot of science and engineering work that's done to make sure it's going to be safe. And every single location there are people like me studying the geology, studying the risk of earthquakes, studying all the different ways we need to do that to make sure it's going to be safe.

Bryce: Sounds good to me. Now, can you tell me, is it true that geothermal energy only works in countries that have lots of volcanoes?

Professor Amos: That is absolutely not true. So we don't have any active volcanoes in Australia.

Bryce: True.

Professor Amos: But we do have lots of geothermal energy. So we all know rocks can be hot because of things like volcanoes. They can bring melted rock right up to the surface. But in some places the rocks themselves are naturally hot, and some of that heat might be still sitting in the centre of the Earth from when the Earth formed over four billion years ago.

Bryce: Wow.

Professor Amos: Some of that heat is actually generated inside the Earth itself, so natural rocks and minerals are changing over time. And part of that process, we call it radioactive decay, it actually generates heat. So the Earth is constantly creating heat.

Bryce: Unbelievable. It's like we have a power plant under our feet.

Professor Amos: We do. It's just up to us to work out how to get it out.

Bryce: Absolutely. And that's what you're working on. On the subject of which, what kinds of geothermal projects do we have happening here in Australia?

Professor Amos: So, one of the things we have the most of in Australia are we call them ground source heat pumps. And that's the type of geothermal energy system where we don't have to drill very deep at all and we can bring up heat. Maybe we drill something like two hundred meters beneath the surface, which is really easy for us to do. It might sound like a lot, but that we call that shallow drilling. And at those depths the rocks might be about thirty degrees C. So kind of like a nice hot, sunny day. Yeah. And so we can circulate water in pipes that goes down and gets warmer as it goes down. And then we bring it back up. And so we bring this nice warm water in the pipes into a building to heat the building.

Bryce: So the earth beneath us is not just a power plant, but it's also a natural water heater just sitting there waiting for us to access.

Professor Amos: Absolutely it is, it is. We do have lots of interest in using geothermal energy to make electricity though, and that's really exciting in Australia at the moment. So, there's nobody in Australia making electricity from geothermal energy right now. But we have had a few pilot projects in the past that have been successful. The thing with Australia is we're a really big continent and it's very expensive to drill, and for making electricity from geothermal, we probably need to drill four or five kilometres down, to get to the rocks that are hot enough to make electricity.

Bryce: That is a big drill.

Professor Amos: It's a big drill and it costs a lot of money. And so, what's happening at the moment… there are scientists and engineers all over the world finding ways of doing that more efficiently and without costing as much. And that's changing all the time. And so there's a lot of people who are interested in looking at how we can harness that new technology to, in the future, make geothermal electricity in Australia.

Bryce: Amazing. So that could be for some of the Squiz kids listening. That could perhaps be a job for them in the future.

Professor Amos: Absolutely.

Bryce: Finally, if you could bust one big myth about geothermal energy for kids and their parents, what would it be?

Professor Amos: So, I think some of your listeners wondering might be worrying a bit about whether we can use up all of the Earth's heat. If we were to increase the amount, we were taking out to heat our buildings and power our cities.

Bryce: Right.

Professor Amos: So I really want to reassure everybody and bust that myth that the Earth's heat will never, ever run out. We could power all the energy needs on Earth. And it really wouldn't make any difference to the amount of heat coming out of the centre of the Earth.

Bryce: Professor Amos, I am officially excited. Thank you so much for taking time to join us on Planet Warriors.

Professor Amos: My pleasure.

Bryce: Thank you, Professor Amos. And thank you, Rocky. From bubbling hot springs to deep earth drilling, geothermal energy is a hot topic with a bright future. It's powerful, renewable, and it's right under our feet.

Rocky: Next time you see steam rising from a kettle or a hot tap running. Think about this: there's a whole world of heat down there, and we're just starting to tap into it.

Bryce: We'll be back next time with an episode that's full of energy in a totally different way. We're talking bioenergy. Yep. Energy from plants, food waste and even poo. Until then, stay curious, stay grounded, and keep being Planet Warriors.