Australian Government

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International Atomic Energy Agency Scientific Forum:

Nuclear Technology for the Sustainable Development Goals

Nuclear science, electric future

Wednesday 28th September 2016

International Atomic Agency Headquarters
VIENNA

It is a great honour to speak today on behalf of my country, Australia.

It is also a pleasure to represent my second home: *the future*. I call it my 'home' because – like most scientists - it's where most of my thoughts reside.

Of course there are no accredited ambassadors for the future – although maybe we might do better if we had some. But unofficially, I think that all of us are here today in that capacity.

When we signed up to the Sustainable Development Goals, we promised to make the future a better place.

But with a task so ambitious, where do we begin?

I take my cue from Richard Smalley, the Nobel Laureate for chemistry in 1996, who distilled all the challenges for humanity into a top-ten list.

At the top of Smalley's list was energy. And it makes sense.

Look at any period of history in which our species leapt forward and life improved. Pushing that wave was an energy innovation.

There could be no Bronze Age without the kiln; no Iron Age without the blast furnace; no Industrial Revolution without steam; no Information Age without electricity.

And there will be no Sustainable Development Age without technology leaps on that scale again. That is the reality we took to the Paris Climate Change Conference last year.

But we emerged from that meeting with two enormous imperatives: energy for progress, emissions cut to nil.

These two imperatives meet in the future I call THE ELECTRIC PLANET.

Why electric? Ladies and gentlemen, electricity is as close to magic as it comes. It is energy in its most useful form: energy that gives us maximum control. It is safe, it is versatile and we can make it clean.

So that's STEP ONE in the vision: we replace all electricity generation with low-emissions sources, as we work to spread the benefits of electricity right across the world.

And that leads to STEP TWO: we triple electricity production.

Which allows us to achieve STEP THREE: the use of low-emissions electricity to replace fossil fuels wherever they are currently used. Electricity instead of petrol and diesel in cars. Electricity instead of wood and gas in homes. Electricity instead of methane and coal in industry.

That's the Electric Planet the combination of unfettered global progress, and near-zero emissions.

Yes, it will be difficult.

In percentage terms, and this might surprise you, coal is still increasing its share of the global energy mix – from 25% in the year 2000, to 29% in 2015.

Solar and wind remain a fraction of the total in the near term - but their contribution is growing.

Of course, even in Australia, there are days when the sun doesn't shine and the wind doesn't blow. So the Electric Planet needs mass storage, as well as clean baseload supply.

We need storage, but building it at scale is a bigger task than most of you might think. For example, if we took all the lithium ion batteries we produced right across the world in 2014, how long do you think we could rely on them to satisfy global electricity demand?

Forty-six seconds, ladies and gentlemen – forty-six seconds before the global demand would exhaust a whole year's worth of lithium-ion battery production.

So we have work to do.

But human ingenuity is a mighty tide – and we simply have to surf on the optimal waves.

There are two readily scalable sources of low-emissions electricity: one, solar and wind with storage, and two, nuclear energy.

In Australia, the appetite for nuclear baseload is small. But that does not mean that we are bowing out of the global nuclear conversation!

At the provincial and the federal level, we are investigating options to expand our participation across the breadth of the cycle: from exporting uranium to storing the waste.

And we will continue to invest in nuclear research, whether or not we opt for nuclear power – because it assists us in any number of ways.

Every time I visit our research flagship, the Australian Nuclear Science and Technology Organisation, better known as ANSTO and represented at today's forum by its CEO Adi Paterson, I come away with new ambition. I only wish that it was compulsory for students and politicians to take the tour.

They would see our high-intensity neutron diffractometer attached to the research reactor. Being Australian, we call it WOMBAT.

With WOMBAT, we can see the crystal structures in lithium batteries far more clearly than X-rays allow. We can make better batteries, more swiftly, as a result.

WOMBAT has a companion. Yes, it's KOALA – a single-crystal neutron diffractometer.

With WOMBAT and KOALA, we have phenomenal insight into the workings of solid-oxide fuel cells: devices that get far more bang for the hydrocarbon buck. They're promising today – they'll be even more efficient tomorrow.

But that's just the start.

We can use nuclear techniques to help us deal with the high temperatures in thermal solar plants. We can build better solar cells and semiconductors. And by engaging in that research at ANSTO, we can understand what it means to operate a modern reactor at the optimal level of safety – so we can make a meaningful contribution to the global conversation.

It is science like this, all across the world, that will put that better future within reach.

So the view is optimistic from both my homes: Australia, and the future.

From the future I bring you a vision of an electric planet, where we use electricity – humanity's friend – instead of fossil fuels.

Of crucial importance, *all* that electricity comes from low emissions sources so that our energy future is reliable, affordable and helps us build the sustainable world that we want to live in.

The challenge is not to reject energy – but to tame it to this generation's ends.

History suggests to me that we can do it, and that the IAEA has a leading role to play in achieving this goal.

THANK YOU