Australian Government

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AUSTRALIA-JAPAN BUSINESS CO-OPERATION COMMITTEE JOINT BUSINESS CONFERENCE

Australia and Japan – enduring partners in science

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This conference is a testament to the enduring power of relationships and collaboration in business between Japan and Australia. But what is not always recognised is that Australian and Japanese scientists have also enjoyed a longstanding history of collaboration. This was formalised in 1980, when our nations signed a treaty of research and development cooperation, in science and technology.

One of the first initiatives between our governments involved the construction of Questacon – the National Science and Technology Centre – which opened in Canberra in 1988. Questacon was built with the support of the Government and business community of Japan. Their contribution – a bicentennial gift to Australia – amounted to half the cost of the building.

At its opening, Australia's Prime Minister said Questacon would "justly stand as an enduring symbol of the friendship between Australia and Japan". His words have held true. Questacon is now much more than a building. With up to half a million visitors each year, it is a truly loved and appreciated icon for Australian science. Close to every Australian school student visits Questacon once during their schooling – I am sure all Australians here today under 50 would have visited Questacon at least once!

And the ongoing links with Japan have continued at Questacon. Just this year – as the culmination of a 4-year partnership with INPEX to improve energy literacy in Japan and Australia – Questacon created eight interactive energy exhibits that were gifted in June to the Joetsu Science Museum in Joetsu City, Niigata Prefecture. They are currently on public display.

So where has collaboration in science and technology between our countries led us over the subsequent decades? Let me give you some examples.

Australia and Japan cooperated in the safe return of the Hayabusa space missions, which brought samples of asteroids back to Earth, first in 2005 and again in 2019. These missions are helping us to unravel some of humanity's

enduring questions of how we have life on Earth. The return capsules from Hayabusa 1 and 2 touched down near Woomera in South Australia – the most recent containing five and a half grams of the most pristine pieces of our solar system ever to be studied, containing amino acids that could have given rise to life on Earth.

Australian and Japanese researchers have also collaborated on the genomic sequencing of two individual crown-of-thorns starfish – one from Okinawa in Japan and the other, Australia's Great Barrier Reef:

- decoding the genetic basis of the chemical signals released by the starfish
- discovering how they communicate to form aggregations
- and how they flee from predators.

Crown-of-thorns starfish have an enormous appetite for eating hard coral – an adult can consume up to 10 cubic metres of coral a year. Starfish outbreaks have been responsible for the extensive loss of reef-building corals on the Great Barrier Reef, which has experienced four destructive outbreaks since the 1960s.

Building on the discoveries from the genomic sequencing project, researchers from the University of Queensland have developed a stable, environmentally benign bait that mimics the natural attractants released by the starfish. Next year they plan to undertake large-scale laboratory and small-scale field trials of the baits. If successful, they will be deployed as part of a scalable mitigation strategy. This is incredible considering a massive outbreak of crown-of-thorns starfish at Okinawa 40 years ago had divers handpicking more than 1.5 million starfish off the reef.

The reason I raise this is it shows how collaboration enables us to scale – something that is critical for our current work in the energy transition. Another collaboration is in synchrotron research. Synchrotron radiation is as bright as

one million suns, giving access to light in wavelengths from infrared to X-rays. Synchrotron light allows the structural and chemical properties of materials to be studied at the molecular level.

In 1992, the Australian National Beamline Facility was established at KEK's Photon Factory in Tsukuba – Japan's national research facility for synchrotron radiation. Together with its successor – the Australian Synchrotron – it enabled Australian scientists to achieve, over 16 years, 4,000 days of synchrotron beamtime at overseas facilities in Japan, the USA and Taiwan.

Today, the Australian Synchrotron in Melbourne is used by thousands of researchers each year. It has been used to undertake detailed chemical mapping and analysis of mineral samples, opening up a new field of bio-geological mineral exploration and allowing scientists to observe traces of economically important metals. It's been used for faster and more detailed analysis of proteins and other molecules, contributing to the study of biochemicals and the development of new pharmaceuticals, and aiding the development of improved treatment options for blood disorders. It has helped researchers to identify how cow's milk can be manipulated for more efficient milk processing practices and better-quality milk products.

With Japan's assistance, Australia developed the expertise to support these valuable research and development projects. And just as Japan supported the development of Australian expertise, Australia is now helping to expand the international synchrotron research community, with an agreement signed last year that will enable researchers from Singapore to access the Australian Synchrotron for essential research.

These scientific discoveries in the fields of space, marine science and synchrotron radiation are just a small sample of what has been achieved by

Australian and Japanese researchers working together. It is international collaborations that have been central to Australia's scientific success.

We've made collaboration a habit – more than half of our publications are co-authored with international partners. And the quality of our science attracts international attention: our outputs are cited 60% more than the global average. We co-author with many Japanese scientists – as a share of our total international collaboration, Japan accounts for close to 5 percent – with the top joint research fields being physics and astronomy, clinical medicine and biology.

Australia is just 0.3 percent of the world's population, but our scientists – often working in collaboration with international partners and investors – publish 4 percent of the world's scientific publications. We are a country that achieves a lot with what we have.

Japan is a natural partner for Australia. We have a strong and longstanding friendship. Japan is our second largest trading partner, our second largest export market and third largest source of imports. We share strategic objectives. We have an interest in each other's prosperity and security. And we are complementary countries in so many ways.

For example, as we grapple with the challenge of climate change, both our countries have the goal of reaching net zero emissions by 2050. It is our collaboration, our joint pursuit of scientific solutions, that will serve us best in meeting the challenges of the energy transition.

As the Paris Agreement makes clear, collectively we need to hold the increase in the global average temperature to well below 2^{o}C above pre-industrial levels, and to pursue efforts to limit the temperature increase. For Australia, these are legislated emissions reduction targets. Our challenge is to decarbonise at an average annual rate of 17 megatons of carbon dioxide equivalence per year – a rate more than 40% faster than we have ever

achieved since 2009. Forty percent. We don't have a choice. We need to ramp up our efforts, and act with speed and smarts.

Our government has committed to transforming Australia's electricity supply with a national renewable electricity target of 82% by 2030. It is supporting the development of new, clean energy industries, the decarbonisation of existing industries, and the transition of Australia's workforce. And it is working to decarbonise Australia's transport sector – which contributes 19 percent of our emissions – by establishing electric and hydrogen vehicle infrastructure and supporting access to electric vehicles.

Australia is investing significantly to decarbonise our economy and working with countries to scale up global action. Our focus is on growing and modernising our electricity grid, boosting energy performance and supporting electrification. And we are committed to capturing opportunities in hydrogen, critical minerals and upstream industries, as well as realising low emissions industry growth opportunities in our region.

One of the most important contributions Australians can make to the goals of the Paris Agreement is to unlock our vast potential as a supplier of critical minerals and energy transition metals, which I know has been discussed a lot during this conference. Australia's *Critical Minerals Strategy* – released earlier this year –provides the framework to grow Australia's critical minerals sector and ensure that Australian minerals can supply the industries and technologies crucial for the global net zero transition.

Let me put the scale of the required growth in the supply of critical minerals that is needed into context. The International Energy Agency projects that demand for critical minerals for electric vehicles will grow by approximately 30 times between 2020 and 2040. Three critical minerals in high demand for electric vehicles are lithium, graphite and cobalt. Demand for lithium could

grow around 40 times, and demand for graphite and cobalt could grow by around 25 times.

That's one technology driving demand for critical minerals. But minerals like lithium, vanadium, silicon and rare earths are also in high demand for storage batteries, solar panels, wind turbines, and a range of defence and medical technologies. Two years ago, Australia produced more than half of the world's lithium – 55,000 metric tonnes. That's great for our balance of trade but in 2021 only 10% of Australia's lithium-ion battery waste was recycled. It's a challenge – with waste from lithium-ion batteries in Australia growing by 20% per year it could exceed 136,000 tonnes by 2036.

But it also represents an opportunity. An opportunity to develop one part of a circular economy. Not only do we want to repurpose lithium waste, but also to reduce the impacts that mining this critical mineral has on the environment. When I visited Japan last year, I heard about recycling programs that are well developed compared to our own recycling that is in its infancy.

We're using technologies that are heavy on energy and the environment. So there's work to be done to create a circular economy and to refine our recycling technologies – or design better ones – so that we're not creating new environmental problems for ourselves. We need to move beyond a mindset of just 'dig up, process and use'.

The Japanese Government and Japanese businesses have a proven record of investing in critical minerals projects in Australia. Japan is a priority partner for Australia on critical minerals supply chains, and we welcome the investment in renewables from Japanese domestic firms and from multi-nationals. Increasing investment and collaboration from international partners like Japan will be crucial for the growth of Australia's downstream processing capability and in building diverse, resilient and sustainable global supply chains.

We are also well placed to cooperate on clean energy. We have made a good start with Japan – through the Partnership on Decarbonisation through Technology – to enhance bilateral cooperation on climate, decarbonisation and clean energy to achieve net zero emissions by 2050.

There is still more to do.

I also want to talk about hydrogen – which has the potential to be an important contributor to our energy transition in areas such as industry, transport, grid firming, chemicals and metals production. We have practical initiatives like the Hydrogen Energy Supply Chain Project and Australia's Guarantee of Origin scheme trials that will provide the foundations for the new global hydrogen industry. I encourage you to have your say on latest round of government consultations on the Guarantee of Origin scheme which are open for feedback from both Australian and international stakeholders.

We marked the start of this major new energy export industry early last year, with the delivery of the first liquified hydrogen to Japan using a specially built ship, the *Suiso Frontier* – designed and constructed using the technical knowledge of Kawasaki Heavy Industries. The *Suiso Frontier* has a liquified storage tank – whose manufacture drew on technologies developed for the JAXA Tanegashima Space Centre to give it ultra-high thermal insulation performance and keeps the hydrogen at the cryogenic temperature of -253^{o}C. Its delivery by sea – from the Port of Hastings in Victoria's Mornington Peninsula to Kobe, Japan – was a world first between two countries.

Australian scientists and engineers are keen to draw on Japanese expertise to build our hydrogen industry and help meet Japanese demand for energy. And there is a lot of research, development and scaleup we still need to do to realise its full potential.

Let me give you a couple of examples where this is already happening.

Japan's Mitsui & Co in partnership with ENGIE Renewables Australia, and with funding from the Australian and Western Australian Governments, are building the 'first of kind' Yuri Renewable Hydrogen to Ammonia Project — at Karratha in Western Australia. The project will construct a 10-megawatt electrolyser to produce renewables-based hydrogen. It will replace a portion of the hydrogen currently produced at a liquid ammonia plant from steam methane reforming – a process that uses natural gas. Construction is expected to be completed in 2024. Its operational data is expected to be valuable for a range of industry stakeholders looking to design, model and analyse future hydrogen projects.

In January this year, the ENEOS Corporation opened a pilot green hydrogen facility at Brisbane in Queensland, supported by the Japanese Government's Green Innovation Fund. It is powered by an on-site solar system and produces hydrogen in the form of methylcyclohexane – that can be stored and transported as a liquid. The liquid will be refined back to hydrogen at the ENEOS facility in Japan. And this is just the start. ENEOS intends to apply the insights gained from the pilot facility to develop a bigger electrolyser plant – over 30 times larger – planned to be ready for commercialisation in two years' time.

Another important development is happening through the Quad partnership – involving Australia, Japan, the United States and India – where we are giving quantum some serious attention, among other frontier technologies. Earlier this year I launched the Quad Centre of Excellence in Quantum Information Sciences, with my co-chair, Professor Ajay Sood, Principal Scientific Adviser to the Government of India. The Centre's focus is on quantum communications, computing, sensing, and enabling a "quantum ecosystem" among Quad nations. I am delighted to co-chair the Centre because it has enormous potential to bring leading quantum technology experts from across

the four Quad nations together, to identify cross-border investment opportunities, facilitate technology collaborations, and expand market access.

Just overnight Fujitsu RIKEN unveiled a 64-qubit quantum computer using a new approach to wiring. Quantum will be an important capability to enable many of these currently intractable problems.

Earlier I asked the question ‘Where has collaboration led our two countries since we signed a science and technology treaty in 1980?’. I think you will agree with me that scientific collaboration has spurred us to answer the critical scientific questions of our time. And in those answers, develop applications that – with investment from governments and business communities – mutually increase our prosperity, improve our energy security and benefit our environment.

I am reminded of what Professor Creagh – the former director of the Australian National Beamline Facility’s technical committee – said three decades ago about imagination. He said that people often think ‘If only we had the tools’, but tools can lock people’s vision. He believed that the uses of synchrotron radiation were only limited by the imagination of the user. I would argue this is true for any of the emerging and frontier technologies now at our fingertips — quantum, AI, machine learning and other critical technologies.

But we also need to recognise that some questions cannot be answered by science alone. Australia’s referendum on an Aboriginal and Torres Strait Islander Voice to Parliament this weekend is one of those questions. I personally hope that Australian voters will recognise the positive opportunities that such a collaboration with First Nations peoples could bring for our country.

Just as Australian and Japanese scientists have demonstrated, collaboration finds the answers to the questions that matter. 65,000 years of knowledge accumulation is a critical component for our future. When we work together

then we can achieve so much more. I can’t stress enough that collaboration is essential for success. Australians can address the global challenges we face – with Japan and our international partners, and with our First Nations peoples.

Collaboration between our countries and peoples has never been more important as we weather the massive global challenges we face today.