

## National Press Club, Dr Alan Finkel, 02 March 2016

### Transcript of 30-minute Q&A session

**Chris Uhlmann:** We're going to take some questions from the media. But you have asked us to think big today so I might kick off with a big problem: climate change. We've seen politicians try and grapple with this. Is there any hope that there might be technology that comes to the rescue in some way? We've seen the rise of the Tesla battery and is that move to renewables a bit more difficult than perhaps some would have us believe?

**Alan Finkel:** Well if you represent the shoals, they're dangerous! It's just such an important question. I guess three parts to answer your question. The global political will to collaborate on various initiatives. I really can't speak to it. It's something that politicians have to work out. We've, I think, seen a declaration of intent like we've never seen before at COP21 in Paris. It doesn't require enforceable activities and initiatives but it certainly sets the stage for such things to come in later on.

So in terms of changing the mood globally, I think it's really been pretty good. But mood itself won't solve the problems of climate change.

There are two big areas where technology can help. One is on the energy productivity or more specifically, the energy efficiency. It's the low-hanging fruit that people often refer to and you see it all around. I'm not sure that you've got it here, I'm hot, I'm not sure you've got LEDs in the National Press Club. But most of us are converting to highly efficient lighting in industry and our homes. That counts for a lot. You've seen over the last 20 years with the STAR initiative on appliances, appliances get much more efficient. Refrigerators are about five-fold more efficient now than they were 50 years ago. Initially when efficiency improves you don't reap any benefits because people think "I can afford this, I will get two refrigerators or a second television" but eventually they saturate their needs and you reap a permanent benefit.

When I was driving around in Germany a few years ago, I was seeing a lot of building activities on what looked like multi-hundred year buildings in good condition. They were mandating that even the heritage buildings had to be retro fitted with triple glazed glass, because so much of – in their case heat - was being lost in winter. So there's a lot that we can do through encouraging or regulating around energy efficiency, and it's a no-brainer. It's hard to think - I can't think of any reason why we wouldn't be doing that on a systematic basis.

But the third part is what we can do in terms of new technologies. And mind you I'm avoiding policies, but what can we do in terms of new technologies that can make the transition to a low-emissions world practical? And I think that there's actually a lot that can be achieved.

You mentioned Tesla in the context of intermittent power. We all know that solar and wind are fantastic in the sense that they're clean and they're scalable. I said it's small so far, but that's off a standing start of zero 5 years ago, and if we commit to building our solar and wind, it's probably affordable over a 20 or 30-year period and that's the sort of time frame you have to be thinking about. Nothing changes fast in the energy industry, it's just too big, it's like a ship that needs many, many tugs to turn it. But the prices have come down to the point where solar and wind as a generating source, they're quite competitive and their prices will come down further.

But the whole of system cost is very high. And that's why you see, for example, in Germany - I won't use local examples - but in Germany the price for electricity is quite high because they're committed to intermittent renewable energy sources and they have to buy in electricity when the electricity's not there. So what we need now is to be investing in storage, developing storage technology. I see this as the moral imperative of our age. We've solved, we should recognise victory, the generation challenge with solar and wind. But we have a long, long way to go on storage technology and without it, solar and wind won't deliver what we really want.

So it's not just Tesla, it's LG and Panasonic and most of the large battery manufacturers, they are all focused on building what we think of as large battery packs for your home so you could go off-grid or get more effective use. But even that needs to be scaled. And Tesla, for example, is famous because they've committed to building a giga-factory to build their batteries and the giga-factory by the time it's finished in 2020 will cost about \$5 billion US. Not cheap. But it doesn't take a lot to work out that if you want to back up around the world, across the planet, solar and wind for the days when there's no wind and the nights and especially the winter periods where there's not much sun, would you need - and if you make some assumptions like a 10-year life of the battery - you would need a couple of thousand Tesla giga-factories just to supply the batteries that we need. Do a couple of thousand by \$5 billion US, and you end up with very, very big numbers. So it's expensive, but it's achievable over a multidecade period especially as the costs of building those batteries come down.

And it's a long answer, sorry, but the last part of the answer would be: if we work out how to do that, produce as much affordable zero emissions electricity as we need, why not triple it or quadruple it so we can use all of that extra electricity to replace the oil and petrol that we use in our vehicles for transport and all the natural gas that we use for heating in industry and in our homes, in our commercial buildings?

**Chris Uhlmann:** OK. Next question is from Australian Associated Press.

**Elise Scott:** Thank you for your speech, Dr Finkel and congratulations on the new gig. I also want to ask you about climate thing but slightly more specific. Last month at Estimates, you said that you were in conversations about maintaining Australia's climate change research capacity in the wake of the changes at the CSIRO. I was wondering if you might be able to provide us with an update on those conversations and is it still your view that Australia's capacity hasn't been undermined yet and do you think that that could be undermined into the future? Are you worried that there will be gaps after having those conversations?

**Alan Finkel:** So going back to the statement from Senate Estimates where I mentioned that I was in discussions, I am in discussions and those are continuing and I think they're continuing quite effectively. It's not a public forum, it's me trying to use my office to try to facilitate discussions between the key players in climate research in Australia. And they're all enthusiastically participating in that process and I hope that by bringing all that intellectual horsepower into the one room, we can identify optimal ways forward.

But you asked, am I on the one hand confident that Australia can deliver on its climate research obligations, on the other hand do I feel that they're under threat? Well of course it's a bit of both, isn't it? Australia has tremendous climate research capabilities. And I think it's arguably the case that we represent the best climate research in the Southern Hemisphere. The CSIRO, for its own reasons, has had to make some reorganisational changes - not imposed by government - but it's had to make some organisational changes in order to pursue other areas. And that is impacting their ability to contribute. I don't want to trivialise that. It's really important things that they're doing there, but it is in the context of a lot of other climate research that takes place in Australia. So what we're trying to arrive at through this discussion group of the leaders in climate research from quite a few different areas is the best way to take into account what CSIRO is doing, rely on the fact that they themselves have said that they are putting and will continue to put effort into coming up with translational systems or systems to enable them to translate some of what they are doing across to other people. If we can rely on that and the goodwill of these discussions then I'm optimistic that we can continue to maintain our cast. But it won't happen without a lot of effort. These are serious issues.

**Joanna Mather:** You are one of the three Fs I believe reviewing the R&D tax incentive. What flaws have you answered in that scheme and sort of related? You mentioned the landmark tax reform that had occurred in Sweden that allowed the Vasa experiment to occur. What is one thing that you would change about Australia's tax system to make it - or to encourage innovation?

**Alan Finkel:** So let me answer that specifically in the context of innovation as you finished there. I'm not going to go into the broader issues of company tax rates and superannuation and everything else. So we do have an R&D tax incentive scheme which has been running for quite a few years and working quite well. It depends on whether you're a glass half full or a glass half empty person, whether you see the increase expenditure in that system as evidence of its success or as perhaps evidence of it being overused and rorted.

So we're looking at the R&D tax incentive not under a mandate to cut the cost to government. We are really looking at it under a mandate to look the three things: does the R&D tax incentive as currently constructed have the integrity efficiency and additionality that we would like it to have, integrity in the sense, is it being rorted and there's no evidence that it's being massively rorted but could it be slightly improved? Maybe. Is it efficient? For a lot of the small companies who very legitimately benefit from it, there's quite a cost in preparing all the paperwork associated with it, and they inevitably end up paying that to highly paid tax consultants and so the money that goes to the tax consultants of course is not being spent on the R&D. So we're looking at the efficiency of the system.

But true to its intention, the most important thing about the R&D tax incentive is additionality. Is it encouraging additional or new research that might not otherwise have been undertaken without that financial encouragement through the R&D tax incentive? I can't give you a formal answer on that. There is reason through our consultations to doubt that it's always doing as intended and so we're deeply looking at that. On the other hand, we've seen good evidence where it's very effective, especially in very small companies that are spending 50 or 60% of their turnover on R&D.

The issue is a complex one, extensive surveys have been done, we've gone back and looked at earlier reports and we're considering it really with an open mind from point of view of what will drive the intended outcome when it was first envisaged. And we're also cognisant of the fact that it's been tweaked from time to time and there's tweak fatigue out there. And we only want to do things if they will deliver.

But your question went on and talked about the broader question of what we can be doing to in a sense fund or support innovation in Australia. Compared to our other comparable countries across the OECD and some selected countries in Asia and Americas, we probably spend more through our government on indirect support of industry - not probably - we do spend more on indirect support of R&D in industry than we do through direct support. So other countries - and America is a particular example of this - they actually, through competitive grant schemes and directed contracts, spend more to support business R&D than they do through tax forgone. So one of the things in the long term - and there's no immediate promise for addressing this - is to deal with that imbalance, if you like, but there are some good things already happening.

We have some small schemes such as accelerating commercialisation, a little prototype starting up called BRII but we also have the CRC scheme in which government invests in industry research through collaborations, ARC linkage, the new CRCP scheme, and I think it would be legitimate to include the biomedical translation research fund that the government announced last December, \$250 million going into co-invest with private industry. It would be legitimate to include that amount of money as a direct investment by the government in business R&D. So whilst it's our balance between indirect and direct is not as clear as it is in some other countries, it is moving in the right direction. I would hate to balance it by chopping off the tall poppy. We need to be investing in both areas.

**Adelaide Advertiser:** Thank you for the address today. You mentioned in your speech that you've never been afraid of risk. I'd like to ask you about the possibility of locating a nuclear waste dump in South Australia. Could you talk a little bit about what you see as the major risks and also what the scientific benefit may be? And just quickly, do you have any comments on how we're operating electricity grids at the moment in order to reduce costs for customers in South Australia, for example?

**Alan Finkel:** I will take them as two very, very separate questions. Look, the Royal Commission in South Australia has put forth its interim report. And it will be putting forward its final report, I think, in May. It's clearly done an extremely deep dive and careful investigation of virtually everything you can think about in terms of nuclear fuel cycle, including nuclear waste storage or as you were asking about it, the high-level waste storage. And they have come to the conclusion that technologically it's an achievable thing to do and if it was done there's potentially a significant business opportunity for South Australia in storing other people's waste in South Australia.

So as an engineering and scientist looking at what I see in that report, and bring to bear any other knowledge, I have confidence in the technological analysis that was done in that report, and if you want to know more of course I refer you back into report. But as the report itself pointed out, decisions about storing nuclear waste in South Australia and frankly anywhere, are complex decisions that have to be made by politicians ultimately take into account community values and community concerns, and the economic practicality.

So these are decisions that are way out of my purview. As they say, above my pay grade. If I do not feel confident that the technological analysis in that report was reasonable, if I felt that it was biased towards a pre-determined outcome, I would speak up. But I think that it was an extremely well-done report. So that's answering your question on nuclear.

The next one was on the price of electricity in South Australia. I think there are probably political, economic and market-driven reforms that could be done but from the technology point of view, two things spring to mind. One is they have to invest in better connectors between Victoria and South Australia so that if they go into the doldrums and don't have wind, because they are becoming quite reliant on large amounts of wind electricity on good days, they can purchase it effectively and they've been caught out because there's only one connector at the moment so doubling or tripling that connector would be a good thing to do that.

But then that invites consideration of the electricity market and the way stand-by electricity generation is costed in this country. For example, in the UK, the electricity market is set up such that somebody who builds a brand-new natural gas generator is paid just for doing that and having it on stand-by. Because natural gas generators or natural gas turbines as they're called can be switched on very, very quickly. And so they can act as the battery for wind power. If the wind drops, within a minute you can get those natural gas generators up to speed and provide all the electricity you want. It's not as clean as having wind but it's certainly cleaner than coal and so they've decided to invest in supporting that but we don't do that yet in this country. So there would be micro-economic reforms - well, certainly in the electricity market, reforms that would assist to get some cost benefits, and encourage people into the market, in addition to, say, the technological implementation of an extra second or third connector.

**Chris Uhlmann:** Just briefly on another kind of dump - a low-level nuclear waste dump, something the States asked the Commonwealth to look into in the 1970s and every single one of them ever since has said "Don't build it here". Can you tell us what kind of waste we're talking about there? Should people be terrified by that?

**Alan Finkel:** The previous question was specifically about high-level waste we don't generate in this country so that would be a business opportunity to bring the waste in, bury it, and charge customers in Korea and India and other countries for doing that. What we do generate in this country is waste from our research reactors and it's between low and medium-grade waste, waste from medical imaging or medical diagnostics and in some cases, medical therapy. When you hear radiotherapy, that's typically X-rays. It's not nuclear, but some therapies use radioisotopes and that's a low-level nuclear waste.

So the Federal Government has been looking at storing low-level nuclear waste somewhere. And that's the challenge. We already store this low-level and intermediate-level waste in dozens, maybe hundreds of places around the country. Because when hospitals use these radioisotopes for diagnostic or therapeutic procedures, they can't just put them in the kerbside waste bin. They have to store them and they end up storing them onsite. So we do have a situation where a lot of this low and intermediate waste is being stored in many places and so far, it's been effectively done, and credit to the industry that there's been no significant problem. But having that waste stored in multiple sites probably would be at a higher risk of something going wrong than if it was all being stored at one site with an enormous commitment to the procedures and the multihundred-year requirements around that centralised storage so that's what's being considered by the Federal Government. It's in process. It's a decision that Josh Frydenberg as the Minister for Resources and Energy will have to take on board on behalf of the government. And it's going to be politically tough. There are social State rights, economic issues. Better him than me!

**Chris Uhlmann:** But it's already here and it's in a hospital near you.

**Alan Finkel:** That's right.

**John Millard:** Dr Finkel, as well as being an innovative scientist, you're also an outspoken advocate of science awareness and popularisation. You're patron of the Australian Science Media Centre and helped to launch and continue the popular science magazine Cosmos which of course you do with your wife Elizabeth. It's interesting that you're also an electrical engineer. Dr Mike Gore was the founder and original director of Questacon the national science and technology centre here in Canberra, done much to popularise science, and he also is an electrical engineer. And so we can go back, possibly to Edison and some people might say the original electrical engineer Michael Faraday. Is there something particular about electrical engineers that make them both inventive scientists and great popularisers of science and if so, what is it?

**Alan Finkel:** Ha ha Well, you know, I could ask you why you're even surprised by the fact that engineers would be interested in communication. I can do punctuation. I can construct sentences. I can really only speak from my own point of view. I was born somehow with the genes that gave me passion for science. So as a young kid, I was doing the proverbial build-a-crystal set and as a 10-year-old, I was buying Electronics Australia, which is a magazine on how to do home hobbies, I have just always been interested in anything to do with physics, the human body, ultimately neurosciences, and for me, it really is a stage of life.

I've heard life described as being in three trimesters, the first 30 years it's all about me, growing up, getting your education; the second 30 years, it's all about family and career, investing in your children, your spouse, and your career; and the third trimester which could be 30 years or we hope a lot longer is give-back time. So I really had the opportunity when I sold my company in America, a bit over 10 years ago, to actually consider what I was doing and realise that I enjoyed talking about the things that had been important to me.

I felt that my career had been successful because of my education here in Australia, both at school and university in my Monash University years, I did my post-doc at ANU and they all contributed to what I became so I wanted to give back to Australian society. I am married to a woman who is naturally gifted in communication, and so around about the time that I was in a give-back mood, we had a lot of discussions and decided Australia needed a more literary science magazine, so Elizabeth and myself and two others co-founded Cosmos mag and it's just been a joy to be associated with that magazine over the years. I'm no longer involved. I have relinquished all of my previous activities in order to take up this role, and Elizabeth is delighted, she's got free rein as editor-in-chief to do whatever she wants. And she's driving it forward as appropriately as you would expect.

**Simon Grose:** Speaking of learning from failure - in the 30 years or so that I've been either involved in or closely following the R&D sector and the area of public policy in terms of research, a key goal has been to increase the interaction between industry and research. And as you say, as you said in your speech, we are now - I think we've gone backwards. We're 33 out of 33 OECD countries on that metric. Now, in that time there's been billions and billions spent, lots of innovation statements and hubs and CRCs and this. And if you had a 30-year research project and you spent billions on it and you got nowhere, you would tend to think maybe we should stop doing this research. So can you give us any pointers as to any new ways that you and the other two Fs can change the culture in Australia or support a change of culture to actually change our performance?

**Alan Finkel:** There are a few things that are already under way, but we've not seen the benefit of them yet because they're still in either pilot or planning stage. So last year and the year before, I was President of the academy of Technology and Engineering and with Peter Gray and other colleagues in the Academy, we put forward a proposal to try to encourage engagement from universities to industry. And we piloted that in all the universities in Queensland and in South Australia, and it was quite successful in its pilot. And it has been identified by the government in the innovation statement last December as having indicated the importance or shown them the importance of encouraging university and Medical Research Institute researchers to reach out. It's going to be developed over the next year or two by the ARC into a more formal plan.

What it's trying to address is that through the international rankings and through our own Australian ranking called the ERA we've become very focused on publications and citations to the extent that there's an unanticipated side effect, that researchers actually in some cases, not all, in some cases resent the time spent, if they were to invest in working with industry, they resent the time spent there because it doesn't lead to publications and citations so what we're trying to do with the new indicator is balance that out and give them credit for engagement activity to live alongside the absolutely appropriate credit that they get for the core research that is visible through their publications and citations.

In addition to that, through the review led by Ian Watt into university bloc funding last year, they adjusted the formula for bloc funding, and so now universities will get some of their indirect research funding based on a formula that includes industry engagement, in addition to how they've been doing in research. So these will change culture because Vice-Chancellors will say "We need this money." Money can influence behaviour for sure.

There is a possibility that we've talked about through the R&D tax incentive to look at ways of using the R&D tax incentive itself to encourage the opposite direction, industry to reach into research institutes. But I can't speak to that because absolutely nothing has been agreed, even the idea - you know, there's no commitment to do that. And if there was, how would it be done? But there is consideration.

We're well aware of the problem. And the last thing I would say is I'm seeing good evidence of industry itself wanting to reverse the trends of the last 20 years. So Woodside is investing in innovation centres in some of our universities; Cisco is doing that big-time; some of the international drug companies, Pfizer and GSK are working with Australian universities, American companies. Off a low base there's a significant increase. We've got a long way to go but I think with the promotion of the need for taking a bit of a risk, working with industry, the cultural change that's starting, combined with some of these monetary encouragements, we could be entering an era where there will be significant cultural change.