Australian Government

Chief Scientist

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2017 JOHN MONASH ORATION

Power and Progress

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General Sir John Monash was one of those remarkable people who blaze through life collecting careers. By my count, he had at least 24.

He thrived in peace and war, in business and government, through the Depression and in times of prosperity, in public and private life.

And we honour him to this day, on the $100 note.

If we added up all the $100 notes in circulation, we would put his value at approximately $30 billion – about the same as the brand of Harry Potter.

But, of course, he's bigger than Potter: he's priceless.

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Now without doubt, anyone would be flattered by the opportunity to deliver the John Monash Foundation Oration.

But for me, it's personal.

It's the eight years I served as Chancellor of Monash University; and the 52,512 new graduate hands I shook in that time.

It's the hours of my life I spent on the daily drive to and from Monash University; on – wait for it – the Monash Freeway.

It's the John Monash Scholars I've come to know, some of them in the audience tonight; and all of them, incredible people.

And most of all, it's a night that's seared in my brain, that could almost convince me to believe in fate. Almost.

Thursday, October 6, 2016.

I'm driving home from speaking at the launch of a new science centre at Scotch College.

Scotch College: John Monash's beloved school.

It's approaching 11 pm, and I take a call from the Federal Minister for Energy.

"Alan, would you accept a commission to take on electricity?"

Electricity: the last great commission of John Monash's life.

As the inaugural Chair of the Victorian State Electricity Commission, from 1920 until his death in 1931, General Monash was truly a father of the electricity grid.

Our very own General Electric – as well as my personal hero.

I clocked in for my first full day at work on our National Electricity Market review on October 8 – the very day we marked the 85th anniversary of Sir John Monash's death.

And ringing in my ears to this day are the words that he delivered in a speech from 1924, one of the many salvos he would fire in this last great phase of his life.

Let me read them to you.

"Electric energy has become the servitor of humanity. Its utility is destined to expand until it dominates future civilisation.

"Even our homes have been invaded, and the conditions of domestic life have been wholly transformed.

"The world is becoming, by a process of peaceful penetration, steadily, but none the less surely, electrified."

The title of his speech was "Power and Progress: the Era of Electricity."

We could have borrowed it verbatim for the Review of the National Electricity Market – the so-called Finkel Review – that we published in June this year.

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No, I don't believe that even General Sir John Monash could have orchestrated events to create the perfect lead-in to a John Monash Oration. But I do know what it's like to be haunted by the very thought of his disapproval. He just had that effect.

Well into the 1960s, Prime Minister Robert Menzies would tell the story of a long distant day, in the midst of the Great Depression, when the Victorian government dared to refuse Sir John Monash a request for a million pounds – about $75 million in today's money.

Menzies was a junior Minister in Victoria at the time.

When Monash heard the news, he invited himself to a meeting with the Premier and Cabinet, which the Premier found he could not refuse.

As Monash entered the room, all present rose to their feet.

"Mr Premier, I gather that the Cabinet has rejected my proposal."

The Cabinet, collectively, shuffled its feet.

"Well, that can only be because they've utterly failed to understand it. I will now explain."

Half an hour later, with the Cabinet reduced to a withering heap of abject misery and desperate repentance, Monash produced the necessary legal contract.

It was signed, and Monash departed with his million pounds.

More than three decades on, Sir Robert Menzies lived with the trauma of that occasion. But I think he saw it as character building.

And sometimes I think to myself that it wouldn't be such a bad thing if we *all* lived with that image of Sir John Monash, waiting just outside the door, ready to walk in and bludgeon us into submission by his brilliance.

How would we tackle the great challenges of our time if we could live up to the Monash expectation?

In particular, how would we tackle the challenge that I was gifted on the night of October 6: the challenge that Sir John Monash called "Power and Progress", and that we have inherited as the great Electric Trilemma?

Electricity!

- Make it cleaner.
- Make it cheaper.
- Make it constant.

And in the spirit of Monash, make it happen.

I am convinced that we can; and – if our recommendations are adopted! – we will.

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But let me step back from the Electricity Review for a moment to give you a sense of our place in history.

In 1924, Monash drew a line in time and called everything to the right of it the “Electric Age”.

In hindsight, we might describe it as the Electric Age 1.0.

It was built on the assumption that there would be one state-wide grid, and one government-owned operator.

The electrons would come from a few big generators. Those generators would burn Victorian coal.

The electricity would then be used for lighting, cooking, industrial processes like smelting, and to power the motors of our factories and public transport.

Centralised, controlled, predictable: Electricity 1.0.

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The next age began with computers.

Why? Because computers completely overturned the expectations.

Before computers, a black-out that lasted a day would be inconvenient.

After computers, a black-out that lasted a milli-second could be catastrophic.

And computers did something else as well: they souped up science, technology and innovation, to a frantic pace.

With the aid of our thinking machines, we began to envisage a world where electrons could come from a solar panel on your roof.

Where two million solar panels, on rooftops all across Australia, could feed into the grid, along with wind farms and solar farms and gas-fired generators and batteries.

Where the one grid could be broken up into microgrids, allowing households to trade their electrons, peer to peer.

Where you could manage all these things from the opposite side of the world, via an app on your phone.

Where everyone on the planet, all seven and a half billion of us, would demand the incredible electric life we take for granted.

Where cyber-criminals and solar storms and a speck of dust colliding with a satellite in space could turn our orderly existence on its head.

Throw climate change into the equation, and you have disruption. Rampant disruption.

Electricity 2.0.

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And so we come to our place in the story, another bright line in time. And we cast our minds forward to what might come.

In the past, I've called it the "Electric Planet" – but we could think of it today as Electricity 3.0.

Please note that it falls in the chapter of the Finkel Review we called "Beyond the Blueprint".

It takes us several decades into the future.

Electricity 3.0 looks like this:

- We convert all electricity generation to zero-emission sources.
- We back up those sources with storage technologies we've scarcely begun to imagine.
- But it's not enough. We need to double it. Triple it.
- We ramp up that cheap, reliable and clean electricity production.
- Then we run the world electric: electricity instead of petrol in cars, electricity instead of gas heating in homes.

I repeat, beyond the Blueprint – but well worth keeping in mind.

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So there we are: at our particular moment on the timeline.

From the past: the brilliant legacy of Sir John Monash.

To the future: Electric Planet, Electricity 3.0.

Right here, right now: the great challenge of our time.

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How would I urge you, the present and future leaders of our society, to proceed?

Let me boil my answer down to three words: *Aspiration*. *Encouragement*. *Education*.

Aspiration.

Encouragement.

Education.

We need all of them to get things done.

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Number one: ASPIRATION.

Aspiration is not simply imagination. It is imagination *plus* action. It is striving for the dreams in your mind, in the rock-solid belief that there is *always* a better way, and if you want it, you can claim it.

That ethos is the essence of good engineering.

John Monash expressed it as the difference between executing an instruction, and re-framing the expectation.

He thought that the country was bogged down, lacking in vision, and incapable of imagining anything better than just doing more of the same. He said so, all the time.

And he treated the country's engineers as the equivalent of the jump leads on the nation's soul, connected to the battery of his brain: his way of firing up the impulse for change.

Evolve the vision, mature it, and share it, he said to his fellow engineers; help people to work together for a future they might actually want.

Not just different, but better!

I have now spent the last ten months of my life travelling the country, listening to businesses and communities, and talking to public servants and politicians. My colleagues and I had one goal in mind: to frame the way forward for Electricity 2.0.

It was clear to us that there is a passionate desire for change. And those who are the most passionate – those who seek out the evidence, reach for solutions, put skin in the game – are those who are driven by the vision of a better future.

Not those living in the mirage of a golden past.

Not those warning of a global apocalypse.

Those with aspiration.

Those who say our electric future can be great, should be great and *will* be great.

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Number two: ENCOURAGEMENT.

The next time you're cruising down a highway in California, or zipping around Norway, you'll see something new and striking on the side of the road.

Stations where you can charge an electric car.

And the charging units at these stations are beautiful.

Streamlined, elegant, and gleaming: when you plug in, you feel a surge of pure *future*.

Where did they come from?

Would you believe me if I told you that they came from Queensland?

That the very first time I saw this charger, it was just an ugly sheet metal box with protruding wires – like a partly disassembled Dalek from the props department of Dr Who.

That the proud owners and builders were three young men, who initially set out to develop an electric vehicle motor controller, with no idea that they would one day be building electric highways, all over the world.

It's true. And it's a reminder that dreams do scale – with encouragement.

Back then, I was involved with an electric vehicle company called Better Place.

I led our company in a project to support those three young men, and their company, Tritium, to develop their prototype fast charger.

Through our own vision of a transformational new market, we encouraged Tritium to pursue a novel opportunity.

They also received encouragement from the University of Queensland, where the founders met as students in the University's Solar Car Racing Team.

Subsequently, they were backed by public investment; and just as importantly, encouraged to demonstrate their technology in pilot projects here in Australia.

Then they were able to tap into some of the best business mentors, investors and partners across the world, catching the surging momentum towards electric cars.

A fortnight ago I picked up a copy of The Economist magazine.

On the front cover, a picture of a clapped-out petrol engine, oozing oil and covered in rust.

Above it, in giant letters, the word "Roadkill".

On the inside, the lead article, with the title: "The death of the internal combustion engine".

Incredible to read it in The Economist: one of the most significant journals of our time. Incredible to even *think* it.

But that kind of great change is simply the sum total of many courageous decisions, not just by students and inventors, but by investors and governments and consumers and regulators. Courage.

General Sir John Monash knew a great deal about the art of encouragement.

He inspired men in battle just like he persuaded governments to give him a million pounds at home.

Relentless preparation, mastery of the detail, and willingness to take absolute responsibility for the outcome.

That is how he encouraged others not to take a leap of faith – but instead, to take a calculated risk.

Venture capital is important – but *courage* capital, well-invested, is gold.

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And finally, to number three: EDUCATION.

Part of the Monash legend is the story of the day in 1930 when he was invited by some disgruntled compatriots to lead a military coup.

Monash replied, by letter:

"Depend upon it, the only hope for Australia is the ballot box and an educated electorate."

He was right.

But education is not merely the pre-requisite for a measured, respectful, intelligent public debate – and yes, I do believe that such a debate is possible.

Education is the way we arm ourselves for life.

And Monash, who sat for 94 examinations in *17 years* of tertiary education, knew its power, far more deeply than most.

One of my duties as Chancellor of Monash University was to do the honours at graduations and listen attentively to the Vice-Chancellor's speech. At least 20 times per year.

The same John Monash quote would appear every time. And, in fairness to the Vice-Chancellor, it is worth repeating.

"Adopt as your fundamental creed that you will equip yourself for life, not solely for your own benefit but for the benefit of the whole community."

In this quote, General Sir John Monash goes beyond today's mantra on what's wrong with education in Australia.

The critics chant that we must train our students for the modern world, equip them with "21st Century Skills". Of course we must.

Sir John Monash knew it, at the dawn of the 20th century, which is what he meant by students equipping themselves for the benefit of the whole community.

But his starting premise was that students had to equip themselves for their lifelong careers, with foundational skills and knowledge.

For them to do so, educators must set the bar of aspirations high.

They should raise the bar for every student, in English, in science and in maths.

That itself is not enough. Our education system is then obliged, as its most important priority, to do its utmost to help our students to clear the high bar.

It's a good model.

Let's call it the "high bar and coach" model of education.

For proof, look at the John Monash Scholars here tonight.

Every single John Monash Scholar is a product of high aspirations, and great coaching.

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Let me leave you tonight with that final image: General Sir John Monash at the door. Your door.

General Sir John Monash who insists it can be done.

And General Sir John Monash who says that you're the person to do it.

Let's live up to his expectations.

THANK YOU