

South Australia's economy will be a huge beneficiary from the transition to net zero emissions.

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Thank you for the invitation to speak today at this important conference. I have enjoyed listening to the many interesting and thoughtful presentations.

I am disappointed when I too often see discussion of the Australian economy separate from discussion of the superpower transition. There is questioning of where the investment and jobs will come from in the future Australian economy, and how will we increase our productivity, wages and standard of living, all separate from the issue of the transition to a zero emissions economy.

This is strange. Dealing with the fundamental change that the transition to a zero emissions economy requires should no longer be a side issue or, worse, an issue concerning the costs and difficulties involved in dealing with climate change. The discussion must increasingly focus on the huge opportunities for Australia and how to realise them.

This is because Australia can have more employment and higher incomes in the relatively short term, and be much richer in the longer term, by moving early and decisively in building and expanding the zero emissions economy.

Not only is the transition consistent with a rising standard of living for Australians, I think it is also necessary for this to be achieved.

Indeed, if Australia seizes the opportunity it can repeat the experience of the China resources boom which peaked around 10 years ago; but this time the opportunity can be sustained, rather than boom and bust, and we can manage it better for broadly based development.

The logic is simple and has been clearly and strongly formulated by Ross Garnaut through a number of books on the "Superpower" opportunity.

Australia is the world's largest exporter of gas and coal taken together. Many focus on the costs of losing what has been our large comparative advantage. Two key points are overlooked.

First, Australia has the world's best combinations of wind and solar energy resources, and it has enormous sources of biomass for a zero emissions chemical industry.

Second, we have abundant minerals which will increasingly be needed, and we have the largest or amongst the largest resources of the energy transition minerals. Renewable energy is not easily exported so it makes sense for industry to relocate to the energy source; that is, by economic logic more of Australia's minerals should now be processed in Australia.

Australia's advantages relative to the rest of the world are so significant that their large scale utilisation would materially improve the prospects of achieving the world's climate objectives. In addition to our just over 1% of world emissions now we could remove around another 7% of global emissions that other countries will find very difficult to abate.

Australia covers about 5% of the earth's land surface; supplying about 8% of the world's renewable energy is no stretch given our abundant solar, wind and land resources.

Added to this is the important demonstration effect of Australia transitioning in the way I will describe today.

We can play a large role in the world abatement effort.

Further, while a small minority of Australians still hold with varying conviction that contemporary atmospheric physics is wrong in identifying emissions of greenhouse gasses as the cause of dangerous climate change, even amongst such people there is virtually no active opposition to Australia taking advantage of the economic opportunities in the zero emissions world economy.

Highly relevant to this conference, South Australia has at least twice its population share of these Australian advantages. It has well less than its share of Australia's coal and gas.

The Superpower Institute, which I am proud to Chair, has been established to change the narrative and thereby boost our economic growth by having Australia realise its potential as an economic superpower in the zero net emissions world. Philanthropically funded, the Institute builds on the ground-breaking work of Ross Garnaut particularly and others now at the Superpower Institute.

The Superpower Institute is up and running, albeit so far on a modest basis. We are currently focussing on data on the electricity market, as this market is often misunderstood; and we are also focussing on better data on the sources of methane emissions.

Our focus on South Australia today flows from a report we have been commissioned to write for the South Australian Government.

This work is, however, just the beginning. As we embark on this journey, we recognise the immense effort needed to secure Australia's place in a decarbonised global economic order, which is a once in a century economic opportunity.

The Superpower Institute will focus on practical research and policy to unlock this opportunity; from the regulatory settings and market incentives needed to providing practical knowledge to governments and industry to ensure this opportunity is realised.

Achieving this will require targeted research to fill in information gaps, close collaboration with all interested parties and continuing policy work; albeit in a small but focussed organisation.

Today, my modest aim is to see that all future discussion of the South Australian economy has at its centre the superpower transition.

I will do this by discussing the following three topics.

1. Australia's and South Australia's enormous advantages in the superpower transition.
2. The huge array of economic opportunities for South Australia that can transform its economy and prosperity.
3. What is required to achieve this prosperity.

South Australia can experience a long period of high employment growth with rising incomes. It can reverse more than half a century of a declining share in the national economy.

Exciting times indeed.

1. Australia's and South Australia's enormous advantages in the superpower transition

These can be put under six headings.

First, and as already stated, Australia has the world's best combinations of wind and solar energy resources. We also have a relatively low cost of capital which is vital when most of the costs of renewable energy are capital costs.

Think about that. The world is moving to a zero emissions economy, albeit at an uncertain speed, and we can have the lowest cost zero emissions electricity available for large scale economic development in the world.

Electrification is not only important in itself; it is the lowest cost path to decarbonising for many activities that have not used electricity in the fossil carbon economy.

Further, green hydrogen from using renewable energy to split the water molecule is at present the lowest cost replacement for coal for reducing iron ore to iron metal.

The many chemical manufactures based on ammonia, including nitrogenous fertilisers and explosives for mining, are currently made with high emissions from gas and coal. Green hydrogen from electrolysis will replace these emission intensive activities in the zero fossil carbon economy.

Methanol made from green hydrogen and derivatives of biomass will provide zero emissions fuel for shipping.

I could go on.

South Australia has way more than its population share of Australia's solar and wind resources. The wind resources are widely distributed across almost all coastal regions, and

there are excellent undeveloped wind resources. For example, the northernmost Flinders is one of Australia's best inland wind fields, and amongst the better undeveloped, accessible onshore wind resources globally.

The Global Solar Atlas shows South Australian photovoltaic power output is the best of the five National Electricity Market States in regions with strong grid connections.

Further, a distinctive feature of South Australia's wind and solar resources is their complementary generation profiles over the daily cycle. With this, only a small adjustment to electrolyser production can offset nearly all the variation in solar and wind output in South Australia.

Second, Australia is by far the world's largest exporter of minerals that require immense amounts of energy to process into metals. The conversion of iron ore into metal in carbon-based furnaces alone contributes about 7% of global emissions. The conversion of aluminium oxide into metal also contributes a substantial proportion of global emissions.

Australia is by far the world's largest source of iron ore and aluminium oxide as bauxite or alumina. The processing of these and other materials will be undertaken at much lower cost in Australia than in other countries using our renewable energy.

A key point is that in the fossil carbon world international producers of metals could import our minerals and our coal or gas cheaply; by contrast, the import of our low cost renewable energy is not cost effective.

In the superpower transition the economics of metal production are transformed in Australia's favour.

Iron processing is by far the world's largest source of industrial emissions. South Australia has 44% of Australia's magnetite iron ore which is best suited to direct reduction using green hydrogen.

Third, Australia has the world's largest (for example lithium) or amongst the largest resources of energy transition minerals. These are minerals which will be in much larger demand, possibly some seven times according to the International Energy Agency, than previously in a zero emissions world.

Developing these resources in Australia will reduce the risk of high prices and supply chain insecurity that could derail the world's zero emissions transition.

South Australia has rich energy transition resource endowments that are co-located with abundant accessible renewable energy resources. Currently, for example, South Australia holds 69% of Australia's copper and a similar proportion of Australia's graphite resources.

Fourth, Australia has many times its share of woodlands and other land suitable for carbon sequestration in plants and soils and sustainably growing and harvesting plants as sources of biomass for a zero emissions chemical industry. There will be immense demand for

sustainably grown and harvested biomass to replace coal, oil and gas in chemical processes in which it is impossible to remove the use of carbon and hydrocarbon.

South Australia's existing waste from agriculture and forestry residues are found in high density which would be valuable for conversion into biochar, bio-gas and bio-oil.

Fifth, Australia has the skills, industrial communities and culture and infrastructure developed for the existing mining, agriculture and forestry industries that will be of immense value in the zero emission industries.

We must correct the view of some that the old skills are redundant; indeed, they are more needed than ever.

All in this room today know that the iron triangle in the Upper Spencer Gulf contains one of Australia's most established industrial regions. The industrial communities and culture exist with skills well suited to taking full advantage of the low emission opportunities.

As already mentioned, South Australia has at least twice its population share of all the above advantages. It is important to emphasise again that it has far less than its population share of fossil carbon and hydrocarbon resources.

Sixth, South Australia particularly has a unique extra advantage; this is the broadly based support in the community, and political leadership over more than one and a half decades, for sustainable development and encouragement of renewable energy.

South Australia is well known in Australia and internationally as a leader in decarbonisation, and this will be extremely helpful in attracting the skills and investment needed for the transformation.

This is a wonderful base to build on.

2. The huge array of economic opportunities for South Australia that can transform its economy and prosperity.

The superpower transformation can be South Australia's second major era of modern industrial growth, after the post war expansion under the Liberal leadership of Thomas Playford. That period was distinguished by the state's building of power, water and transport infrastructure that underpinned the growth of the industrial cities of the upper Spencer Gulf.

Such growth was built in part on tariff and other industry protection which was not sustainable in a globalised world.

In contrast, the opportunities now available draw on South Australia's long term comparative advantage, and so are sustainable.

I will mention just six such opportunities to indicate the array of them.

These are large enough, however, to both underwrite the provision of public and private infrastructure that will be important to the emergence of other industries, and indeed to require the growth of many other industries as well.

The first three opportunities provide the essential demand for a large-scale, diversified green hydrogen-based ecosystem by sharing hydrogen and electricity storage and transport infrastructure. The low cost of offering hydrogen at this scale offsets the cost of the necessary water desalination.

These opportunities are built on using hydrogen as a chemical input into hard to abate sectors such as the metallurgical processing of iron, green fuel and fertiliser production.

These opportunities, of course, build on the South Australian Government's pioneering investment in a hydrogen electrolyser. Elsewhere in Australia and the world, private parties are assessing the risk and wondering whether the time is right for investment in these new industries. The South Australian Government is not waiting; it is moving ahead to build the world's largest electrolyser for producing green hydrogen from renewable energy, and making its product available to potential users in industry.

The six opportunities I mention today are as follows.

First, hydrogen-based green iron, with some extending to green steel, utilising South Australian and perhaps some western NSW ores, with the use of magnetite dominant in the early stages.

The first steps on a small scale are economically viable now in each of the cities of the Upper Spencer Gulf. Current direct reduction technologies require magnetite ore which South Australia has in abundance. Realising this opportunity will also require the opening of large new mines in the Eyre Peninsula and in the Braemar Region.

Second, hydrogen to green fuels such as methanol for low carbon shipping, energy storage and air travel.

The availability of globally competitive renewable electricity and hydrogen together with biomass for production of zero emissions carbon and hydrocarbons provides the opportunity for transportation fuels. For example, methanol as a shipping fuel is now ready technologically.

Third, hydrogen to ammonia for production of nitrogenous fertilisers (urea) and explosives and possibly for export.

Ammonia is made through an energy-intensive process that combines nitrogen from the air with hydrogen. It is the foundation for a wide range of fertilisers that are essential to a large amount of global, and Australian, food production. It is also the foundation for explosives used in the mining industry.

Urea is the single most important product made from ammonia that is used in Australia. It is an important fertiliser, and it has a valuable use as a diesel fuel additive which is essential for land transport. China, Russia and Ukraine are important exporters so there is a pressing need to diversify world supply.

Zero emissions ammonia is essential for the decarbonisation of our agriculture and mining supply chains.

Fourth, mining and processing of other energy transition minerals especially copper, and including graphite and rare earths.

The electrification of almost everything, including passenger vehicles, will place a huge stress on the global supplies of copper. Many South Australian marginal deposits will need to be mined in future.

The world is overly reliant on Chinese supplies of pure silicon for photovoltaic panels. South Australia can have a much stronger comparative advantage than China in the production of silicon.

Fifth, metallurgical recycling focussed on green energy waste including from depleted batteries, wind turbines and solar panels.

The State's current levels of sophistication in metal recycling is high. For example, Nystar's Port Pirie site which I have visited often began recycling single-use alkaline batteries in 2022.

Sixth, planting naturally adapted tree species such as the mallee in marginal farming country.

This can be a major source of carbon sequestration and biomass for zero emissions industry. The mallee is well adapted to extreme heat and low rainfall. Its subterranean trunk holds large quantities of sequestered carbon, expanding with the life of the plant.

It coppices quickly after harvesting which can yield considerable char and bio oil.

3. What is required to achieve this prosperity.

Naturally there is much to be done and many requirements to meet to realise the huge prize represented by the above opportunities. It would be a surprise if this was not the case. The risks and requirements are not anywhere near as large, however, as the opportunities and are less than what may be imagined.

To begin with three risks.

First, the world could fail to progress to zero global net emissions. It is important to note that the above opportunities are not dependant on the particular pace of movement. Only that it continues to occur with appropriate purpose. Of course, the costs of failure to avoid

dangerous climate change would dwarf the disappointment in relation to not realising the opportunities mentioned in this report.

Second, the global trading system may break down into exclusive blocs built respectively around the US and China. This is a serious albeit extreme risk, and it would be such a threat to the achievement of global climate goals that hopefully we will see wise heads prevail. It requires continuing Australian and world diplomacy to avoid this extreme outcome, as it always has.

Third, there is always the risk of a failure of Australian management of the opportunity. This risk is by far the greatest at the beginning as initial success will build upon itself.

What are these specific requirements for the opportunities I have described today?

First, there is the need for considerable funding from both the private and public sectors.

Large-scale investment in electricity transmission; desalination and distribution of water by pipeline to mines, towns and industrial projects; and hydrogen production, transport and storage; these are all centrally important to South Australia's superpower transformation. I believe that such monopolies or early investment in new technologies should be publicly funded.

While some may argue for private funding, I think the evidence is clear that public funding is to be preferred. This will provide cheaper facilities given the difficulty of regulating private monopoly assets; the facilities will be more quickly delivered as not all the regulatory details will need to be settled up front, and will not be liable to hold-up demands; and the facilities will see equal access to all private players which is otherwise extremely hard to ensure.

The spend is significant but the Commonwealth will assist as, for example, has been promised with electricity transmission. In any event, there is no reason not to expect a commercial return on such a spend.

With this public spending there exist extensive private funds that will have more than enough incentive to take advantage of the many opportunities that are available in areas where competition can occur.

Second, there is the current high cost of electricity in South Australia. This owes much to the poor state of competition at the retail level which can be addressed as new opportunities arise.

It is also important to recognise that in some part high electricity costs in South Australia stem from the variability in load that comes from the low ratio of industrial to domestic load. This is not an issue in the superpower transformation.

Third, we have the reluctance of some of the current miners to invest in the processing of mineral ores. This will require a change in thinking in businesses operating in Australia, and by the governments that grant them access to the resources they own and lease on behalf of their citizens.

Fourth, we need a large expansion of skills at many levels. We need much more focus in our educational institutions on professional skills in mining, geology, metallurgy, many aspects of engineering, earth sciences, agriculture and forestry, as well as trade and vocational skills in these areas.

In particular we need to reverse the recent trend to cease the teaching of geology and metallurgy in our main universities. They must realise that such skills are essential to the superpower transformation.

Fifth, of course, the people of South Australia must be willing to embrace the challenges that come with substantially more development and population. I believe all communities want to see opportunities in their home environment provided the challenges of development are carefully managed.

Much of the development I have described today will be in the regions, some of whom may currently feel threatened from the climate transition. Further, there will need to be strong engagement with indigenous communities so that these communities clearly benefit.

Hopefully it can be seen that the opportunities far exceed the risks, and that the requirements can all be met.

Indeed, all periods of accelerated growth in Australia have required at least this much effort and risk.

This can be a time of optimism for South Australia.

Add to this the huge opportunity of being a world leader and beneficiary of the transition to net zero emissions.

There is no reason not to start on the journey described here. Indeed, there is nothing to lose but the opportunity itself.

Thank you for your time today, and for this wonderful conference at which it was a privilege to speak.