Investing in cheaper, cleaner energy and the net zero transformation

- Reduce the cost of meeting carbon targets
- Speed up approvals for new energy infrastructure
- Encourage adaptation by addressing barriers to private investment

Reduce the cost of meeting carbon targets

Renewables projects need to consider extreme weather to remain insurmountable

Renewables Infrastructure aboveground projects such as Wind Turbines, Solar Panel Farms and Power Lines have a useful economic life that is critically dependent on climate change impacts such as the Berrybank wind farm in Geelong, Victoria where a wind turbine collapsed during a thunderstorm. A large solar panel farm in Fort Bend Texas was damaged by a hailstorm and wind turbines have been damaged by tornadoes in that State. The useful life of solar panels up until now is estimated to be around the same as that of wind turbines designed at around 30 years, and above ground steel towers with power lines at 40 years. However, all such above ground infrastructure, will be exposed in the future to extreme climate change weather events that will impact increase the cost of maintenance and also their useful lives. Therefore, these renewables useful lives will inevitably reduce to 20 years, and additional maintenance will add to their discount flow cash.

But a new report from a global insurance company states renewables have been found to be subject to natural disasters and extreme weather events are leading to more frequent and severe insurance claims around the world. they are an emerging threat to the insurance industry as extreme weather will increasing as global average temperatures rise.

CSIRO findings also show that the EL Nino-Southern Oscillation weather cycle which impacts Australia is already being exacerbated by climate change, with both strong El Niño and La Niña events – which cause unusually dry, arid and unusually wet, stormy conditions respectively – increasing in frequency.

Last year, One of Australia's largest solar farms, the 400 MW New England solar farm near Uralla a A$30 million were lost in anticipated earnings due to delays caused by extreme heavy rains. Crucially, with investment in renewables in Australia picking back up – and with a 2030 target of supplying 82 per cent of the country's electricity from renewables – projects will continue to push into new territory, which will come with their own weather risks.

The above report notes that factoring "one in 100-year flood events" into the construction of renewables projects in Australia is no longer going to cut it. The long-term success of projects will depend on mitigation strategies that seek to protect assets for the duration of their often 25-year lifespans. Speed up approvals for new energy infrastructure.

Legislative Red Tape

It is apparent that legislation on reporting greenhouse gas emissions has created significant for Australian business already impacted by red tape, with the added complexity of having to meet arbitrary targets as described hereafter. Australia's Safeguard Mechanism applies to facilities that emit more than 100,000 tonnes of carbon dioxide equivalent CO_2-in a year. There are about 215 Safeguard facilities covered across the mining, manufacturing, transport, oil, gas and waste sectors. These facilities produced around 30% of Australia's greenhouse gas emissions. Greenhouse gas emissions are planned to reduce gradually over time on a trajectory consistent with achieving Australia's emission reduction targets of 43% below 2005 levels by 2030 and net zero by 2050. For example, there are 3 types of greenhouse gas emissions and reporting requirements may vary depending on the type of emissions., and then there are 2 types of thresholds that determine a company's obligation under the NGER Act, facility thresholds and corporate group thresholds.

The cost of meeting carbon targets is being born by the above industry sectors and others estimated to be:
Electricity 28%, Energy 20%, Transport 19%, Agriculture 16%, Industry, Waste and Other Emissions 17%.
Each segment has differing factors that need to be addressed using Engineering, Technology and Science.

Therefore Federal and State governments will need to significantly increase annual overall funding of universities and related businesses in the next twenty years into research and development to achieve satisfactory reduction in all the above.

Speed up approvals for new energy infrastructure

Estimating Infrastructure Costs and Critical Path Planning are Essential to Speeding up Future Energy Projects

Estimate Infrastructure Costs

Discounted cash flow (DCF) is method that is widely used by financial management estimating the value of an investment using its expected future cash flows. It is the preferred method of financial analysts to determine the cost of a project today, based on projections of how much money that infrastructure will generate in the future.

Cost Benefit Analysis is also often included with DCF cost estimates as it included cost and benefit measures to estimate the impacts for the Australian community. This responds to our legislative requirement to consider infrastructure that materially improves national productivity. Cost-effectiveness analysis (CEA) – CEA is a partial CBA approach that compares the costs of alternative ways of producing the same or similar outputs. CEA is used to compare the costs of different options. Computed general equilibrium indicator methods are also sometimes included to determine impacts on gross domestic product (GDP), household income and consumption, investment, exports, employment and industry outputs.

Estimating the Cost of Nuclear Power Generation

CSIRO's GenCost assessments for nuclear power stations apparently did not use the abovementioned standard DCF method to determine costs, and included cost estimates, cost of electricity analysis, and consideration of factors like capacity factors, facility lifetimes, and spillage costs. They based estimations only on South Korea's nuclear power plants that primarily use two reactor types, Pressurized Water Reactors (PWRs) and Pressurized Heavy Water Reactors (PHWRs).

Main types of nuclear reactor

- Pressurized water reactor (PWR) ...
- Boiling water reactor (BWR) ...
- Pressurized heavy water reactor (PHWR) ...
- Advanced gas-cooled reactor (AGR) ...
- Other Operable nuclear power plants e.g. Small Modular Reactors

I refer you to my submission on *Creating a Dynamic and Resilient Economy.*

Nuclear energy's increasing momentum could be seen at COP28, where the first Global Stocktake under the Paris Agreement called for the acceleration of nuclear and other low-emission technologies to help achieve deep decarbonization. Another key moment at the climate conference in Dubai was when more than 20 countries launched a declaration to triple nuclear energy capacity by 2050. Last year at COP29 in Baku, Azerbaijan, a further six countries joined the call. With its capacity to deliver low carbon electricity consistently 24/7, nuclear power has prevented around 70 gigatonnes (Gt) of CO2 emissions over the past five decades and continues to avoid more than 1 Gt CO2 annually, according to IAEA's "Climate Change and Nuclear Power 2022" report. Are all these countries wrong using nuclear power generation to produce cheaper energy?

Infrastructure Decisions need to be based on Practical Engineering and Critical Path Analysis

Underground vs Above Ground Energy Distribution Power Lines

Direct Current, or DC, underground cables have the same heat and fault-finding problems as AC underground cables, but don't have the same problems with the energy stored in the insulation. That's why DC is used for long distances and for undersea cables. Wind Turbines abd Solar Pane Renewables generate DC, however, DC must be converted back to AC before it can be used on the grid. Underground power unlike overhead power, underground power is much safer. It's less likely to get damaged from weather conditions and is less prone to causing fires or electrocution accidents. If you want something that lasts longer and requires less maintenance, your best option is underground electric power. High-voltage underground lines may require additional equipment to ensure proper electrical performance along the distance of the transmission line. Underground cables are installed in concrete encased PVC duct banks. Heat generated by the cables is dissipated into the earth. Burying a 240 kV double circuit transmission line at a minimum would require a continuous trench or duct bank at least 3.5 feet wide at the bottom and 7 feet deep. Magnetic fields tend to decrease more rapidly with distance from underground installations compared to overhead lines. Overhead high voltage lines can emit hiss or hum noises. Underground lines are silent except in the immediate area near the transition substations. Even with the above requirements, underground cables useful lives are three times those of above ground power cables. Above ground power lines and their superstructures useful lives will be impacted by increasing maintenance costs due to the impact of extreme future weather events caused by climate change in Australia. Engineers who have constructed underground power cables have designed the conduits to allow for additional cables to meet future requirements. There are also cyber security benefits from utilising an underground cable network to provide secure communications for defence and civilian use.

Note on my recollection of hearing about Australia's engineering wonder of the world at the age of 10 in the UK.

Sir William Hudson was appointed in 1949 as manager of the Snowy Mountains scheme, responsible for the biggest civil engineering project ever undertaken in Australia and one which was referred to as the engineering wonder of the world. He oversaw the completion of this wonder by having exceptional powers that freed him from political interference. *Ref trove.nla.gov.au/newspaper/article 23205854* He said "I do not see merely that we are building seven major dams, 16 power stations, 90 miles of large=diameter tunnels through the heart of the ranges, and 500 miles of smaller pipelines to carry water to storages and the big tunnels. Those are just physical facts of the Snowy project. Behind them I see what may well be any Australian's dream." I suggest similar engineers be found for development of Australia's energy projects.

On 7 July 1949, the Commonwealth Parliament passed legislation to establish a Statutory Authority and start construction of the Snowy Scheme. Hudson also said that as an engineer he only had one purpose that was to deliver the project on time and within cost estimates. Engineers who experienced in project managing use a technique called Critical path analysis is commonly used with all forms of projects, including construction, aerospace and defence, software development, research projects, product development, engineering, and plant maintenance, among others. Any project with interdependent activities can apply this method of mathematical analysis. The method also tracks cost estimates and actual costs incurred during the project, as it provides flexibility in meeting critical milestones that inevitably arise in large infrastructure programs. The Snowy Scheme was established by legislation and successfully avoided politically based approval and its prevalent bureaucratic oversight of the massive project by appointment of Sir William Hudson an engineer who planned and oversaw every major aspect of the project, including the appointment of other engineers to oversight each major separate phase. (Refer below for the Snowy Hydro Schematic)

Approximately 10,000 kilometres of new transmission lines are projected to be needed to connect new renewable energy sources and ensure reliable power delivery which is set out in the map below. The map shows the transmission power lines are stretched over Australian East Coastal terrain that would be amenable to underground cables except where there are requirements for power lines to be installed above ground to avoid geographically difficult natural terrain or manmade impediments. (Refer below for AEMO's Schematic)

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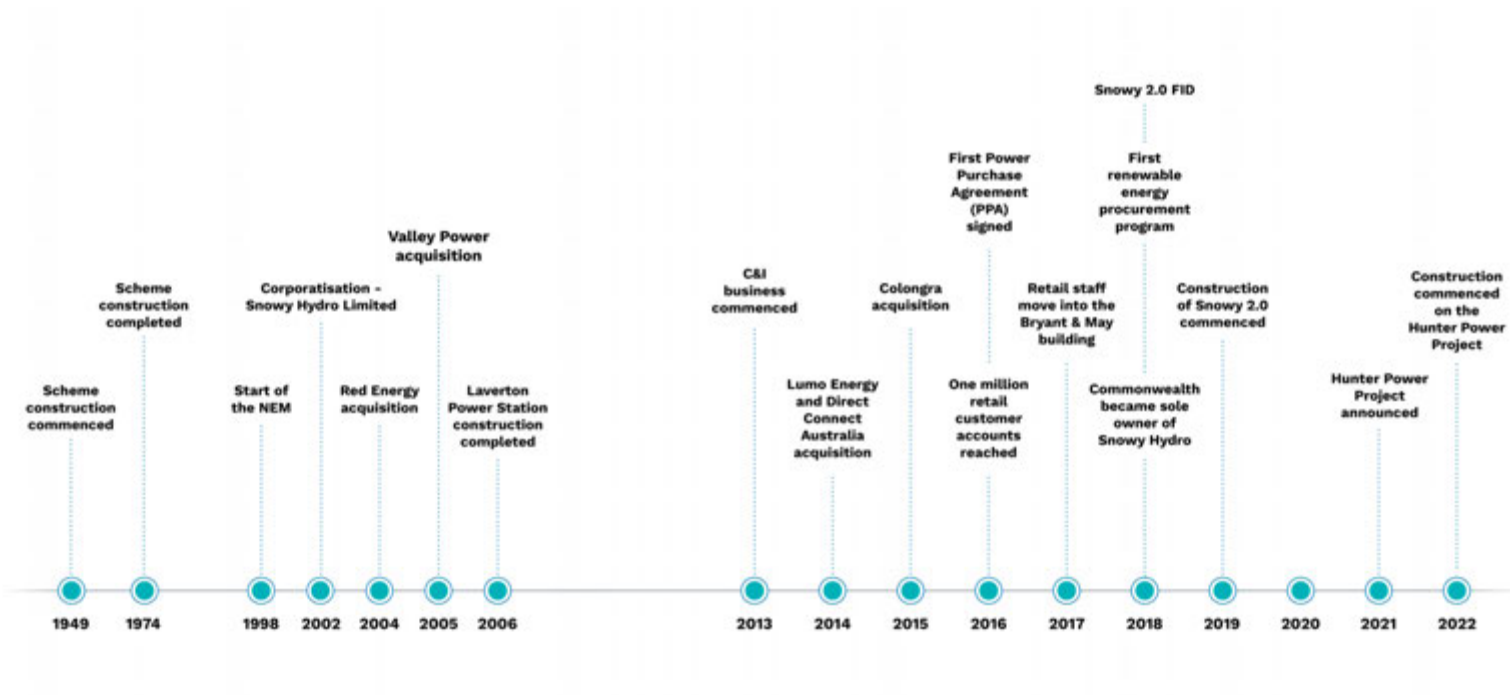
The Snowy Scheme



The scheme cost about $820 million and was completed on time and on budget.

AEMO's Planned 10,000 kilometres of Power Grid by 2050

Set out below is a map of the planned Energy Grid designed to achieve Net Zero emissions by 2050. To date the project has not been legislated or a separate body established in the same manner as the successful Snowy Hydro Scheme.

Figure 3 Transmission projects in the optimal development path

This map shows indicative new generation and storage in 2043, and transmission projects that include 500 kV transmission lines, increase capacity by 330 MW or more, and are required in all scenarios by 2050.

Encourage adaptation by addressing barriers to private investment

Australia's private equity activity has declined substantially in recent years, as borrowing costs increased. Private equity investments can be grouped into three broad categories:

1. Venture capital.
   This involves investment in early-stage or growing businesses with long-term growth potential. Such enterprises have often developed technological, scientific and niche markets often from research and development. The barriers to private investment in such companies are that they are insufficiently capitalised or profitable. It is suggested that such enterprises should be identified and supported by governments and by means of bank guarantees and grants that are refundable in the event of future buyouts of the enterprise.
2. Buyouts.
   These involve the purchase of at least a controlling interest of an established enterprises, after due diligence has established its future return on any investment. Buyouts the intention of improving operations and/or financials before selling the company for a profit. The largest of these transactions are generally leveraged buyouts, which tend to be financed with some equity and a significant amount of debt.
3. Other private equity.
   This involves raising new equity capital to fund further growth and to improve the capitalisation.

Australian buyouts have been highest value in the industrials and utilities sectors, with a relatively small value in IT companies. Industrial and utility companies often have lower risk profiles. As a resource rich country has high demand for capital, Australia has, for years relied on foreign investment. Foreign capital has allowed for economic growth, employment and a higher standard of living. Foreign investment brings with it technological and other benefits associated with the establishment of new businesses, or the modernisation, able to provide high productivity

Australia's Future Power Generation

In conclusion the liberalisation of Australia's trade and investment regimes are contributing factors to Australia's its capacity to withstand the impact of the global financial crises, however this capacity has been eroded in recent years as a result of borrowings in the Covid pandemic period. Nevertheless, Australia's debt to GDP ratio is far lower than comparable countries, and therefore future large investments needed to transition to a much lower emissions economy by 2050 are within the country's capacity if its need to develop low-cost energy supplies. I am concerned that such low-cost energy is necessary for development of future technological industries should be given greater priority. In my submission on Resilience in Australia's Economy I stated that it's power generation and distribution grid will need to generate increased levels of energy to power the development of artificial intelligence and robotics needed in manufacturing and other segments of the economy to meet its socially and economically sound transition towards its 2050 zero emissions targets and beyond. Also, as an exporting nation it will be imperative to establish goods and services that will meet overseas countries' emissions criteria under the UN Framework Convention on Climate Change Paris Agreement on Climate (UNFCCC) Paris agreement. Although the United States, the second largest emitter has announced its withdrawal in 2025.

In Australia, both Federal and State politicians have enacted laws banning nuclear power that prevent the construction or operation of nuclear facilities for power generation. These laws are now 25 years old and, in my view, need to be repealed as Australia to take reflect advances in the performance and safety of nuclear technology in those years. In the next quarter century Australia will need 24/7 power to be available as a back up to renewables to meet its future energy needs. I believe 24/7 energy needs cannot be met by reliance on turbines, solar panels and battery storage, despite technological advances. Therefore, if annual productivity is to rise back to the levels in Australia's past, low-cost power generation needs 24/7 support, and politicians need to come up to the plate.

As a British migrant I acknowledge the declaration of a large part of Eastern Australia naming it New South Wales by Lieutenant James Cook of HMB Endeavour in the name of the Crown of Great Britain in 1772