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ENVIRONMENT AND OTHER LEGISLATION AMENDMENT (REMOVING NUCLEAR ENERGY PROHIBITIONS) BILL 2022

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SUMMARY

The key takeaways in this submission are:

i. Reliable dispatchable power is essential to industrial users;
ii. Minimise pollution, use more gas, nuclear power could be an important contributor to Australia's decarbonisation;
iii. A lack of reliable affordable power could topple a government;
iv. Renewables are intermittent. All electricity technologies have their place, they can be integrated successfully. We should use the strengths of each technology to underpin a cost and environmentally effective energy transition;
v. Research shows that the volume of critical minerals required for the transition to renewables does not currently exist, globally. The additional mines to supply these minerals have not been found nor developed. Existing mines and known resources can only provide a fraction of what is required. We will not meet our 2050 goals if we are reliant on renewable power projects alone;
vi. There is light at the end of the tunnel. If Australia revokes the ban on nuclear energy, small modular reactor (SMR) technology can replace coal burners at power stations which are already dispatching power to the existing grid. We can add to our renewables fleet as demand requires, we can extend the grid as demand requires, we buy the time needed to undertake the exploration and development necessary to source more critical minerals that will be required to complete the transition;
vii. We can deliver on our promised 2050 goals far more cost effectively and with more certainty if we utilise nuclear technology, SMRs in particular.
viii. Australia could become a critical minerals powerhouse, value adding to our minerals by delivering processed and refined metal and manufactured battery products to the world with reliable power produced by an energy mix of renewables underpinned by flexible dispatchable gas and base load from SMRs.

DISCUSSION

As a young Mine Manager in 1988, I was responsible for the construction of a gold mine, its processing plant and the power generation plant it required because it was off grid. Subsequently operating the mine it became obvious that if the mine's generators were not 98% available, that the business could not make enough gold week-on-week to reliably pay wages to the 100 staff let alone pay suppliers of input goods and services. The mine proved to be a success and made expected returns for its ASX shareholders. My learning was that reliable 98% dispatchable power was essential to run a business that produced physical goods.

A few years later, whilst studying part-time for a Master's Degree, a major project during the 3 year course proposed whether Australia should continue to generate power using carbon based fuels and whether a carbon tax had merit because it put a price on carbon use which ultimately could change consumer behaviour. The conclusion was: 1) that a carbon tax would achieve nothing without all countries applying carbon taxes, as we all shared the same atmosphere; 2) Australia should minimise carbon pollution, use more gas fired electricity in this low carbon transition and use its world class uranium reserves to eventually produce zero carbon base load energy. Renewables were discussed, we knew they could become part of the mix but they would never deliver base load dispatchable power. My learning was that we should not pollute unnecessarily, we should use more gas and we should revoke the prohibition on nuclear power in Australia. This was 30 years ago and little happened on nuclear.

A decade later, 2003, as CEO of a pioneering ASX listed company developing a coal seam gas (CSG) project in Queensland, Ministers and bureaucrats explained that security of supply of reliable and affordable power was fundamental to governments. If people got home and flicked a power switch and there was no power, or power was unaffordable, governments could lose power.

Townsville at that time was supplied with base load power from coal fired power stations 1,000 kilometres away (20% of the power was lost as heat over this distance, increasing unit consumer electricity cost by 20%). There was also a peaking power station in Townsville that was fuelled by aviation fuel, it helped Townsville cope with surges in electricity demand, mostly when people returned home from work and turned-on air conditioners. The unit operating cost of the aviation fuel fuelled power station was very significant.

The consumer market for gas from our CSG project was Townsville, with the existing Open Cycle aviation fuel fuelled Siemens turbine being converted to a much more efficient Combined Cycle Gas Turbine (CCGT) using only our natural gas, to deliver 100% of the needs of Townsville. Thereafter the connection to coal fired power stations became only a supply back-up. The use of CSG natural gas in the CCGT was far cheaper for all involved, and it delivered a significant environmental improvement.

At that time it was known that a transition to renewables would require numerous energy sources, coal and gas as base load plus gas peaking stations to back-up renewables and stabilise the grid. That was nearly twenty years ago and there was no clear transition plan.

In 2009, I became a director of a company that provided power stations to remote communities and mine sites that had no access to the grid. Initially most of these power stations were diesel fuelled but over time, for reasons of cost, efficiency and environment, these power stations were converted to use gas or were newly installed as gas fuelled power stations. Further innovation led to the development of and retrofitting of equipment that reduced fuel consumption and produced less carbon pollution. This company became the first such company to successfully integrate solar arrays with a gas power station and have an electronical interface so that the gas generators would cycle up or down when the sun was weaker or stronger. The benefit was reduced fuel consumption and less carbon pollution. The same company has subsequently gone on to integrate wind and batteries, supported by gas and is a leader in these integrated power technologies. What is clear is that renewables are intermittent, there is no battery technology that can back up an industrial scale user's needs, gas is the ideal back-up for renewables as it is easily turned on or off or anywhere in between. My learning here is that all these power technologies can be integrated, they all have their strengths and limitations, they each have their place.

In the last few years we have seen the surge in demand for minerals that are required for the electrification of our societies. Be it copper, nickel, lithium, cobalt, graphite or rare earths, the demand for these critical metals and minerals is now greater than it ever has been and the number of mines that the world requires to supply these commodities dwarfs what we have mined before. Peer reviewed studies from Australian mineral economists are showing us that the worldwide demand for these commodities can not be met from known resources. Decades of geological exploration is required, innumerable project approvals in many different countries will be required to justify the decades of mine development that is required to supply the minerals needed to decarbonise. My learning is that Australia's transition just can not happen in the proposed 2050 timeframe if we rely on renewables technologies, because the volume of critical minerals that are required simply do not yet exist*.

Many of us watch the transition with great interest and some concern. The national rate of transition to renewables has not progressed at anywhere near the rate that it could have. It certainly could have started two decades ago. A result of that delay is that we did not recognise what minerals would be needed and in what quantities. Worldwide there was an expectation that the minerals would simply be available. Australians have an expectation that we will complete this transition to renewables by 2050. Yet recently we have learned that we will not have enough of the materials that are required to build the renewables projects nor build the massively expanded grid network to connect renewable projects with the markets for power (communities) within a 2050 timeframe.

There is light at the end of the tunnel. There has been a change to nuclear technologies in the last 30 years. The development of SMRs has reduced the capital cost and complexity of nuclear power projects. SMRs could allow us to upgrade existing coal fired power stations into non-carbon electricity producers and do so in a timely manner.

CONCLUSION

There is an alternative to trying to somehow build mind boggling numbers of solar and wind farms, connecting all of them within a grid network that links them with communities, and doing this with commodities that are in such high demand that prices are extraordinary because demand far exceeds supply. Physical supply of these critical minerals is also facing a significant shortfall.

What Australia could do, whilst also searching for more critical minerals, is revoke the ban on nuclear power in Australia. Build SMRs in locations where we already have coal fired power stations, that come complete with grids that already transport essential base load power to communities of power users. Grid extensions can occur as demand requires. Renewable projects will be built as demand requires. Costs of inputs will be lower because we will not be trying to get everything done with renewables by 2050. Australia could be operating on mostly no-carbon nuclear energy plus renewables and gas by 2050. Renewable projects will continue to be built and will be backed-up by gas peaking stations. One day battery technologies may be found that can affordably stabilise renewables power supply at large scale, at present this technology does not exist.

As a final point, SMRs would ensure the low cost, dispatchable power needed to operate industrial processes that could be the key to Australia becoming a critical minerals powerhouse, value adding to our minerals by delivering processed and refined metal and manufactured battery products to the world for the electrification of their countries.

Thank you for the opportunity to make this submission.

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*I refer you to the following references on mineral supply required for this transition:

The quantity of metals required to manufacture just one generation of renewable technology to phase out fossil fuels, The Univ. of Queensland, Assoc Prof Simon Michaux https://www.youtube.com/watch?v=MBVmnKuBocc

Assessment of the Extra Capacity Required of Alternative Energy Electrical Power Systems to Completely Replace Fossil Fuels, Geological Survey of Finland, Simon Michaux https://tupa.gtk.fi/raportti/arkisto/42_2021.pdf

It's time to wake up Assessment of the size and scope of non-fossil fuels systems to phase out oil gas & coal, Geological Survey of Finland, Simon Michaux https://www.gtk.fi/wp-content/uploads/2022/06/GTK-time-to-wake-up-presentation-slides.pdf