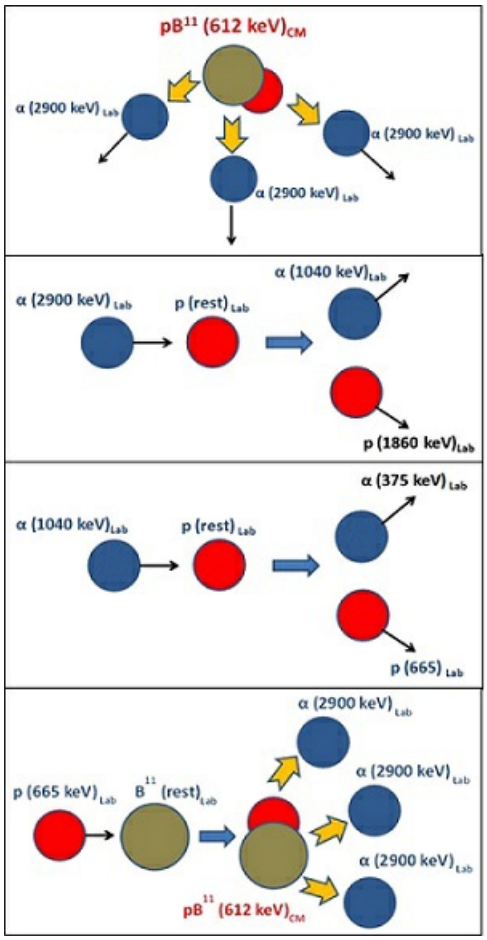
Path for nuclear power in Australia

It's unusual for Australian trade unions to have anything to do with nuclear power. So recent support for nuclear power by the Australian Workers' Union and CFMMEU Mining and Energy Division of Victoria could be a political gamechanger in shifting the Labor Party and nominal "left wing" in Australia from entrenched ideological positions. It's becoming apparent to more people right across the political spectrum that so-called renewables won't provide the environmental panacea that we were promised. Far from it! And a growing number of union leaders understand that average workers will be among the biggest losers if we phase out coal-fired power without a transition to cheap, clean, reliable and safe nuclear power.



Support for nuclear power is growing and breakthroughs in fusion are afoot. Show here, a diagram showing a hydrogen-boron fusion reaction. Source: Cambridge University Press

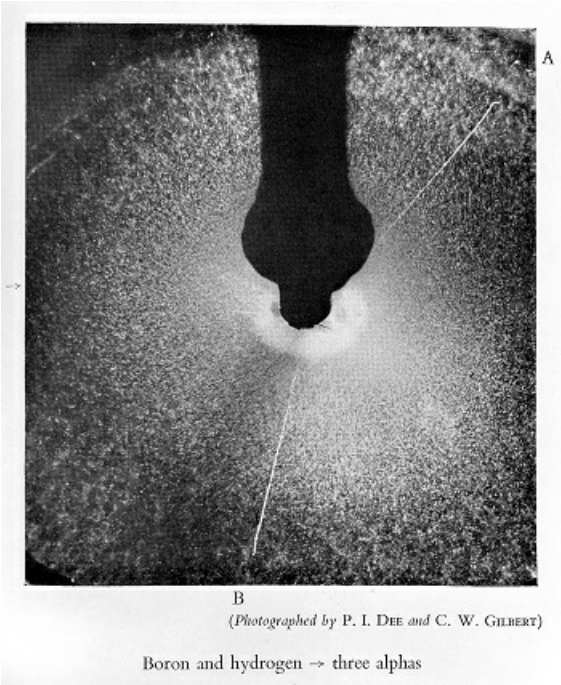
In a July 2020 public policy paper, "Nuclear power through the lens of an Australian trade union", Victorian Branch Secretary of the CFMMEU's Mining and Energy Division Geoff Dyke explains the crisis: "The Union is concerned by the approach of using only non-dispatchable renewable energy sources, supplemented by hydro and battery storage, for Victoria's energy transition. It believes that this will lead to major blackouts, unaffordable electricity and the future economic shutdown of Victoria's industry, resulting in massive job losses and a decline in citizen wealth."

Dyke has worked for 42 years in the electricity industry. He holds bachelor's degrees in both engineering and business from Monash University. His concern for workers' interests and technical knowledge cannot easily be dismissed and this is his assessment: "A 'Just Transition' of coal-fired power station workers and their communities towards a modern nuclear industry is realistically achievable, whereas CFMMEU M&E Vic believes a 'Just Transition' to renewables is not."

The Australian Workers' Union (AWU) in a 40-page parliamentary submission on 28 February 2020 supported nuclear power in a similar vein. This AWU submission warned of "an energy outlook that holds dire consequences for job destruction across the economy". AWU National Secretary Daniel Walton prepared this extensive submission which among its key recommendations, insisted that Federal and State bans for nuclear power must end. The submission also emphasised clear economic benefits: "The cost of energy from advanced nuclear technologies in Australia is set to be cheaper than all renewable technologies and gas-powered generators, and in many cases also cheaper than coal."

The 'renewable' path

In their controversial film *Planet of the Humans*, Michael Moore and Jeff Gibbs explained that "renewables" do not replace fossil fuels—they depend upon them! In fact, global coal, oil and gas consumption have increased over the last decade. The *BP Statistical Review of World Energy 2020* shows world coal consumption in 2009 was 144.53 exajoules; in 2019 it was 157.86 exajoules. Over the same period world oil consumption rose from 167.95 to 193.03 exajoules; and natural gas from 105.88 to 141.45 exajoules. Australia has embraced wind and solar power more aggressively than most countries, so coal consumption has dropped from 2.36 exajoules in 2009 to 1.78 in 2019. But overall fossil fuel use has *increased* because a drop of 0.58 exajoules in coal consumption in the decade has more than been replaced by a 1.19-exajoule increase in combined natural gas and oil consumption.



An experiment showing bombardment of boron by hydrogen, producing alpha particles. Photo: Wikimedia

Moore and Gibbs join many environmental activists who show the absurdity of "renewables" which depend on fossil fuels. But other environmental activists have shown nuclear power is the obvious solution. Michael Shellenberger, for example, successfully helped persuade the Obama administration to invest US$90 billion into "renewables". He now understands this was a mistake, and has become a big advocate of nuclear power.

The nuclear path

Nuclear power is experiencing a renaissance worldwide. Despite domestic bans on nuclear power, as the AWU submission states, "Australia is the third largest exporter of uranium in the world, set to become second in several years' time". The hypocrisy of domestic bans is astounding, and we are losers for it. Worldwide, as reported by the World Nuclear Association, 56 nuclear reactors are currently under construction, 12 of which are in China. Plans are locked in for a further 108 reactors which are mostly expected to be in operation within the next 15 years. Many will be online much sooner given reduced construction times. For example, the latest grid connection occurred on 8 August 2020 for the Tianwan 5 reactor in China's Jiangsu province just north of Shanghai. Construction for this ACPR-1000 reactor commenced on 27 December 2015. A further 329 reactors are proposed worldwide with specific programs or sites.

Many recent safety advances have ensured nuclear fission is here to stay. And Generation IV reactors will be safer again. These include the Molten salt reactor championed by Baroness Bryony Worthington, a long-time environmental activist who worked at Friends of the Earth and was the Executive Director for Europe of the Environmental Defence Fund between 2016 and early 2020. The Pebble Bed Modular Reactor (PBMR) is another Generation IV reactor of the Very-High-Temperature Reactor (VHTR) helium-cooled design. It encases the nuclear fuel in tiny ceramic spheres; in the event of a coolant failure, the reactor shuts itself down without human intervention. Thorium is proposed as a fuel for many Generation IV reactors; its cleaner and more efficient fuel cycle, which produces far fewer "weapons-grade" isotope by-products, has added benefits regarding the non-proliferation of nuclear weapons.

Hydrogen-boron fusion

Australian physicist Prof. Heinrich Hora has designed a nuclear reactor to produce hydrogen-boron fusion power. Photo: Wikipedia

The fusion path also shows enormous promise. A recent series of articles on hydrogen-boron fusion by physicist Dr Jonathan Tennenbaum, published by *Asia Times*, explains how fusion power may become a reality sooner than we think. Dr Tennenbaum reports that Australian physicist and long-time laser fusion expert Professor Heinrich Hora has put forward a roadmap of research and development aimed at building a prototype hydrogen-boron power plant over the next 8-10 years. “According to Hora the price tag would be about $80- 100 million”, writes Tennenbaum. “That is peanuts compared with the cost of building a prototype for a new fission reactor design.”

Hydrogen-boron fusion is a nuclear reaction between the nuclei of hydrogen and boron. “The reaction produces no dangerous penetrating radiation and no radioactive waste, but only stable alpha particles, whose electrical charge even permits a direct conversion of fusion energy into electricity”, Dr Tennenbaum explains in Part 1 of his six-part series. The physics and advantages of hydrogen-boron fusion have long been known among scientists, but until recently the physical conditions necessary for a contained reaction—including temperatures of billions of degrees Celsius—seemed unobtainable in the foreseeable future.

Recent developments in laser technology show promise to make hydrogen-boron fusion a reality. New laser systems can generate ultra-short pulses in the range of a few femtoseconds (one femtosecond equals a millionth of a billionth of a second), and such pulses may now be amplified by factors of a trillion or more. “The method is called chirped pulse amplification”, explains Dr Tennenbaum, “for which its discoverers, Gérard Mourou and Donna Strickland, were awarded with a Nobel Prize in 2018. With the help of CPA, it’s possible to concentrate sufficient energy into an ultra-short pulse so that it reaches powers in the range of petawatts (a million billion watts). That is more than 100 times the power of all the world’s electric power stations combined— albeit only for a tiny instant of time.”

In Part 2 of the series, Dr Tennenbaum explains that hydrogen-boron fusion occurs only with a specific isotope of boron, called boron-11. This is fortunate as this isotope makes up 80 per cent of naturally occurring boron. And the energy is essentially limitless: “On the basis of the hydrogen-boron reaction, a single gram of hydrogen-boron mixture would produce very roughly as much energy as is released by the combustion of three tonnes of coal. Present proven reserves of boron, contained in borax and other minerals, amount to over one billion tonnes. A bit of arithmetic shows us that this would be sufficient to supply world electricity consumption at present levels for a million years.” Part 6 includes the transcript of an interview between Dr Tennenbaum and Professor Hora, the “father of the hydrogen-boron laser fusion reactor”. In this interview, conducted in March 2020, Hora displays the kind of “thinking outside the box” which we seldom see with today’s typical culture of groupthink. It’s this creativity that’s needed to inspire young minds in a nuclear-powered future.

By Jeremy Beck, Australian Alert Service, 12 August 2020
