

'Clean coal': billions of dollars and lots of carbon

By Ben Potter

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The Turnbull government wants to ease Clean Energy Finance Corporation guidelines to allow "clean coal" to qualify for "clean energy" funding but figures from a big Japanese supplier of clean coal plants suggest the guidelines would have to be gutted to get the plants over the line. Jonathan Carroll
A top executive at the largest Japanese supplier of high tech coal-fired power plants says they would likely cost more than thought in Australia and still emit relatively large quantities of carbon.

Akihiko Kazuno, head of global strategic planning for Mitsubishi Hitachi Power Systems, said the company's ultra-supercritical power stations – the most advanced currently being built commercially – typically cost between \$US1.5 billion and \$US3.5 billion per 1000 megawatts of capacity.

Prime Minister Malcolm Turnbull, Energy Minister Josh Frydenberg, Treasurer Scott Morrison and the Minerals Council of Australia – which is launching a "Coal: Making the future possible" advertising campaign – are [pushing for "clean coal" plants to be built in Australia](#).

But [industry says the plants are "unbankable"](#) because of their high costs and carbon risk and resources entrepreneurs [Gina Rinehart and Trevor St Baker have shunned the technology](#) too.

High cost

Assuming Australian costs are at the upper end of the range cited by Mr Kazuno, the cost of building a 1000MW ultra-supercritical plant in Australia would be about \$4.6 billion.

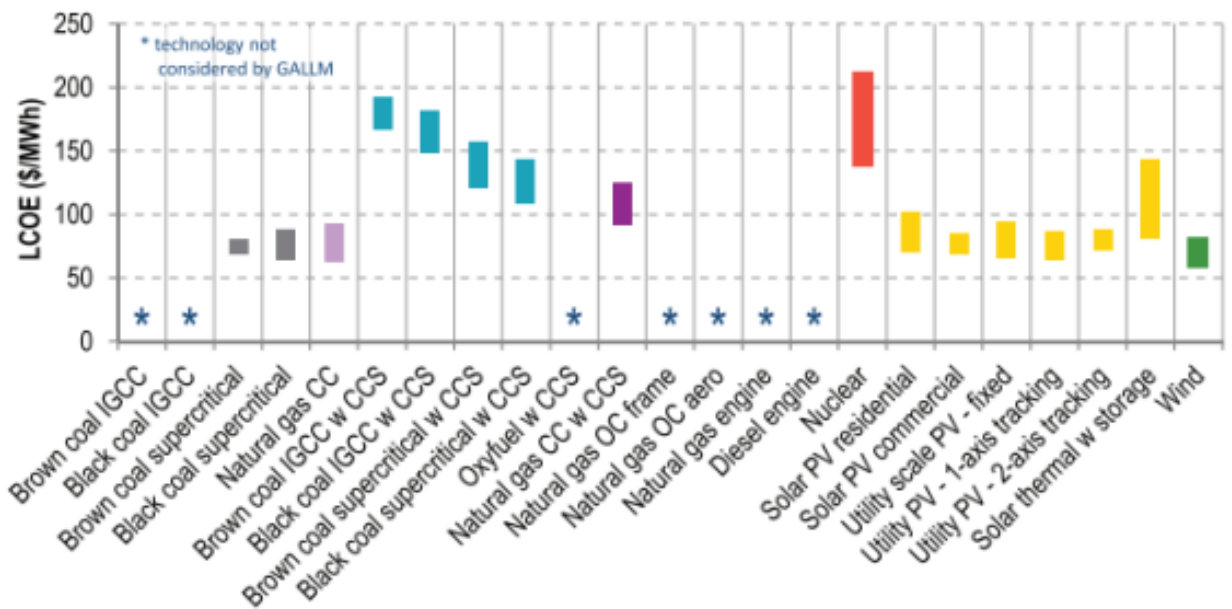


Figure E3: 2030 Levelised cost of electricity (\$/MWh)

Note: LCOE assumptions are as in Table E2, except for natural gas pricing, which is \$6–10/GJ.

Levelised cost of electricity 2030 estimates. CO2CRC

This is much more than the costs assumed in the [CO2CRC's Australian Power Generation Technology Report](#) relied on by proponents of building such plants in Australia, which put the cost at about \$3.1 billion for black coal and \$4 billion for brown coal. But it is close to the \$5 billion-plus per 1000MW costs of two huge 4300MW ultra-supercritical coal plans recently built in South Africa.

Energy expert Bruce Mountain, director of Carbon+Energy Markets, said construction costs in Australia would likely be at the top end of the range.

Ultra-supercritical power plants operate at higher temperatures and efficiency to reduce the amount of carbon emitted by coal generation, but it is still much more than for a gas plant of comparable capacity.

5.1.3 Capital cost estimates

The total plant costs for each of the pulverised coal cases were estimated using the procedures described in Section 15 of this report. The resulting estimates are summarised in Table 32. All costs are shown in June 2015 Australian dollars.

Table 32: Total plant cost for pulverised coal cases

	Brown coal				Black coal				
	Supercritical		Ultra-supercritical		Supercritical		Ultra-supercritical		Oxy-fuel
	No CCS	With CCS	No CCS	With CCS	No CCS	With CCS	No CCS	With CCS	
Equipment	1,161	2,673	1,200	2,747	920	1,954	943	2,027	2,413
Material cost	551	1,033	574	1,068	418	633	438	649	769
Direct labour	1,498	3,009	1,545	3,092	1,186	2,983	1,235	3,026	2,306
Bare erected cost	3,211	6,715	3,319	6,907	2,524	5,570	2,536	5,731	5,489
Engineering, home office fee	245	575	262	599	207	443	212	473	434
Contingency	394	960	415	994	269	738	271	726	828
Total plant cost (A\$/kW sent out)	3,850	8,250	4,000	8,500	3,000	6,750	3,100	7,000	6,750

Note: Brown coal cases are based on a Victoria mine-mouth location; all others are in the Hunter Valley, NSW. Shaded cells indicate EPRI data translated to Australian costs—see Chapter 15.

Capital Cost Estimates. CO2CRC

Mr Kazuno said carbon emissions vary, but he would "assume around 700-750 kilograms of CO₂/MWh for black coal and around 900-1,000 for brown coal" without carbon capture and storage.

Not 50 per cent

This is a 25-30 per cent reduction for black coal plants in Australia, which typically emit just under or just over 1000 kilograms of CO₂ per MWh, and a 28-33 per cent reduction for Victoria's brown coal plants, which emit 1250-1500 kilograms of CO₂ per MWh (excluding the outgoing Hazelwood power station). **A combined cycle gas turbine plant emits about 373 kilograms of CO₂/MWh, according to the CO2CRC report.**

The Clean Energy Finance Corporation's guidelines require technologies to reduce emissions by 50 per cent from the current grid average of 840 kilograms of CO₂/MWh to win funding.



Hancock Prospecting chairman Gina Rinehart is the latest resources boss to reject "clean coal".
Supplied

Mr Frydenberg and Queensland senator Matt Canavan want to [ease the guidelines to allow clean coal to qualify](#) but Mr Kazuno's figures suggest they would have to gut the guidelines to get the coal plants over the line.

The CO2CRC puts levelised (capital and operating) costs for supercritical power stations – an older technology that emits more than 800 kilograms of CO₂/MWh – on a par with new solar generation in 2030 and just above the cost of new wind generation.

Carbon indemnity

These estimates do not include any carbon costs, even though companies such as BHP Billiton commonly factor in a carbon cost when vetting new projects. BHP assumes a price of \$US24 per tonne of CO₂. The Climate Institute estimates carbon risk would require [an indemnity of \\$27 billion-\\$44 billion over the 30-year lifetime of a large plant](#).

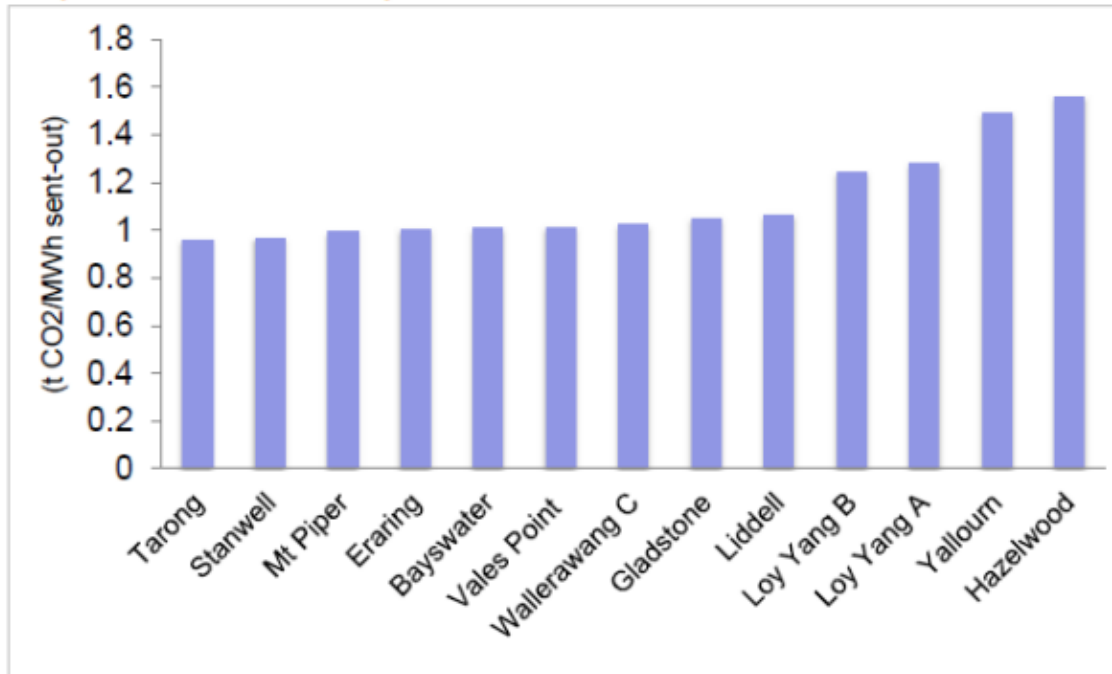


Federal Treasurer Scott Morrison brought a lump of black coal to Parliamentary question time last Thursday to stress the government's support for "clean coal". Alex Ellinghausen

Bloomberg New Energy Finance puts the cost of power from ultra-supercritical coal power at \$134-\$203 a MWh including carbon costs and financing and construction risks, and \$94 a MWh without these risks. By comparison, power from new wind plant costs \$61-\$118 per MWh, new solar plant \$78-\$140 and new gas plant \$74-\$90.

Mr Kazuno said funding from Japan's export finance bank could be available to help fund the purchase of a new high tech power station in Australia, but he said this would not be "soft finance".

Scope 1+3 Emission Intensity



Sources: AEMO, IEEFA estimates

Carbon dioxide emissions by power plant – tonnes of CO2 – black coal from left, brown coal from right. Institute for Energy Economics and Financial Analysis