

Dendrobium Extension Project

Expert Report to IPC

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Introduction

I have been briefed by the Environmental Defenders Office (EDO) acting on behalf of Protect Our Water Alliance to provide independent expert advice in relation to greenhouse gas emissions and the Dendrobium Extension Project. I have prepared this report in conformance with Part 31 Division 2 and the Expert Witness Code of Conduct in Schedule 7 of the *Uniform Civil Procedure Rules 2005*, and I am willing to be bound by them.

I presented at the Independent Planning Commission (IPC) public hearing held on Friday 4 December and provided the IPC with a copy of my powerpoint slides, which are also attached to this report. This should serve as my full review.

I am a Professor in Sociology and Politics at the University of Technology Sydney, where I am Director of the Climate Justice Research Centre. I have been working on climate related issues since the mid 2000's and have led two ARC Discovery Projects focused on climate change and energy policy. The first, 2014-18 'Beyond the Coal Rush', focused on approvals for coal mines in Germany, India and Australia. The second, 2018-22, 'Decarbonising Electricity', is focused on the question of social acceptance and legitimacy for renewable energy. I am lead author for the recent book with Cambridge University Press, '*Beyond the Coal Rush: Turning point for Global Energy and Climate policy?*' (Nov 2020).

Summary

I would like to focus my initial comments on the impacts of the Dendrobium Extension Project (Project) on Green House Gas (GHG) emissions, and consequently on climate change (Section 1 - GHG Impacts). I suggest that the cost-benefit analysis (CBA) submitted by the applicant and endorsed by the Department of Planning, Industry and Environment (DPIE) fails to take into account these critical impacts of the project. If it were to do so, using its own metric for calculating for per-unit cost of emissions, then the Project would have to be reassessed as producing a net dis-benefit of more than \$2bln.

I further suggest that the DPIE report fails to properly assess the impacts, or opportunity costs, of proceeding with the mine (Section 2 – Transition Futures). It is claimed the impacts on the local economy of closing Dendrobium as planned, in 2030, would precipitate the collapse of steel manufacturing in the region. The prediction is alarmist and highly questionable: there is substitute coal available locally and the steel sector is undergoing a decarbonising process that is predicted to lead to considerable jobs growth both in renewable energy and hydrogen. The move to hydrogen-fired steel production is underway internationally: according to the International Energy Agency it will account for more than a third of global steel production by 2050. The present Dendrobium mine will operate until 2030, giving the region almost a decade to make the transition; approving

the mine will only delay that transition to 2048, when much of the rest of the world will have moved on, leaving Australia and the Illawarra stranded.

Section 1 - GHG Impacts

Planning Approval – an Impact Focus

The NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) requires the authorities to focus on assessing the impact of projects, both negative and positive, to arrive at a decision. The ‘Objects’ of the EP&A Act include ‘to promote the social and economic welfare of the community...’ and at the same time ‘to facilitate ecologically sustainable development...’ (s 1.3, as amended, 2017). To enable this the DPIE requires an ‘Environmental Impact Assessment’, encompassing the ‘economic, environmental and social impacts of the project...’. The focus on impacts is reflected in the Project assessment and also in the DPIE’s assessment of the Project. As the DPIE states, in the assessment report it has ‘weighed environmental impacts against socio-economic benefits’.

Green House Gas (GHG) Emissions – an Impact Focus

The anticipated impact of climate instability drives the global goal established by the United Nations (UN) at the 2015 Paris Climate Summit, of achieving net zero GHG emissions globally by 2050. That goal is designed to achieve the UN’s target of keeping anthropogenic global warming well below 2 degrees Celsius (DegC) and pursuing efforts to limit warming to 1.5 degrees C. The UN and the Inter-governmental Panel on Climate Change (IPCC) have undertaken numerous studies into the impacts of increased global warming, and have outlined a series of unacceptable impacts. These impacts threaten to tip the global climate system into a period of radical instability that will threaten habitability across the globe. In several respects that threat is especially pronounced for Australia and NSW.

Unfortunately the globe is well short of achieving this goal. At the Paris Summit most countries around the world, including Australia, submitted Intended Nationally-Determined Contributions (INDCs) as the first step towards the net zero goal. In 2018 the UN calculated that those aggregated INDCs would need to be tripled to meet the 2DegC target (UN 2018). The urgency for the globe to ratchet-up ‘contributions’ to avoid the worst impacts of climate change has been asserted repeatedly.

The necessity to reduce GHG has been recognised within NSW planning decisions principally as an imperative to minimise the impacts of climate change. The 2019 Rocky Hill Decision of the Land and Environment Court stated very clearly that the main reason for considering GHG was the impact that climate change would have in NSW. The judgment stated that:¹

“...the GHG emissions of the coal mine and its coal product will increase global total concentrations of GHGs at a time when what is now urgently needed, in order to meet generally agreed climate targets, is a rapid and deep decrease in GHG emissions. These dire consequences should be avoided. The Project should be refused.”

¹ *Gloucester Resources Limited v Minister for Planning* [2019] NSWLEC 7 [699]

By taking into account the 'dire consequences' of climate change resulting from increased emissions, among other reasons, that court refused the project.

Dendrobium GHG Emissions - an Impact Assessment

The proposed mine extension will expand emissions by 260Mt carbon dioxide equivalent (CO₂e). The EIS, CBA and DPIE assessment reports all draw a distinction between Scope 1, 2 and 3 emissions. Scope 1 emissions (22Mt) arise from the mining process; Scope 2 (1.7Mt) from the power used to undertake the mining; and Scope 3 (236Mt) from the burning of the mined fossil fuels. There is much policy discussion over responsibility for these emissions but, in my opinion, this is not relevant to this planning decision. The IPC and the planning process more broadly (as noted above), is not concerned with questions of emissions responsibility. Under the EP&A Act, planning decisions are made on the basis of project impacts.

Regardless whether a particular unit of GHG emissions is designated Scope 1, 2 or 3, it has the same impact. There is consensus reflected in the Project reports that if the mine extension proceeds then an additional 260Mt GHG will be released into the atmosphere. In my opinion, the impact of the Project on climate change should be assessed on this basis alone.

Dendrobium Emissions - Impacts of 'Scope 3'

The Cadence 'Economic Impact Statement' on the proposed mine extension neglects to assess the impact of the bulk of emissions resulting from the mine. Scope 1 and 2 emissions (23.7Mt) from the Project are included in the costings but not the Scope 3 emissions, of 236Mt. These are assumed not to be 'attributable to the project' (Table 16, p. 24). This exclusion is in conflict with the assessed overall increase in GHG from the Project, which by definition has to be 'attributable' to it (that is, the emissions would not occur if the project did not go ahead). The report states that 'consistent with Australia's international obligations under the United Nations Framework Convention on Climate Change the level of GHG emissions attributable to the Project' it will confine consideration only to Scope 1 and 2 emissions. In this way the assessment confuses Project impact with emissions responsibility: UNFCCC obligations reflected in national carbon accounting rules concern responsibility for emissions, they do not assess impact.

In my opinion, the key task for the IPC is to assess the impact of projects and there is no dispute that this mine will lead to a total increase in emissions of 260Mt CO₂e. The fact that some of these emissions are produced by 'upstream' energy production to power the mine for instance, and by 'downstream' emissions from the burning of the coal, is immaterial. Neither upstream nor downstream emissions would occur if the mine was not to go ahead, hence must be taken as Project impact, *in toto*.

Total Cost of GHG emissions - Using the Cadence 'Proxy'

Cadence uses the current cost of abatement as expressed in the Federal 'Emissions Reduction Fund' (ERF) as a proxy cost of GHG emissions from the Project. It states the ERF unit cost of AUD\$13.52/ton CO₂e is a 'proxy to the marginal cost of abatement' and then applies this ERF proxy cost to the anticipated Scope 1 and 2 emissions (assumed to be 23.7Mt CO₂e).

The ERF proxy cost is plainly a very rough measure of the cost of carbon abatement. The low price tag reflects what the Australian Federal Government currently is willing to pay for emissions abatement to achieve its very modest INDC. It also reflects the very low cost of expanding carbon sinks in Australia: most of the ERF is spent on improving retention of soil carbon rather than on reducing industrial emissions, and is of questionable worth (not least during drought). Internationally carbon abatement costs are significantly higher and there is no doubt that abatement costs will rise in Australia in years to come.

Setting this question aside, and using the Cadence estimate of AUD\$13.562/tonne of CO₂e as proxy for the actual cost of offsetting emissions, we can make a rough estimate of the net cost of GHG emissions from the mine extension. If an additional 260mtCO₂e is emitted at an abatement cost of AUD\$13.52 then the total estimated emissions cost is \$3,515m. The claimed net benefit of the project is \$1,073m; if the impact of the Scope 3 emissions is included in overall project cost, as logically it should be, then the project has a net loss of at least \$2,442m.

Dendrobium GHG Impact – NSW vs the World?

Cadence makes further adjustment to the emissions cost from the mine, stating:

‘The impacts of GHG emissions are global in nature, and as a result, apportioning all the costs of climate change impacts associated with the Project to NSW overstates the cost of these impacts to NSW. To estimate the impacts on NSW, it is appropriate to apportion a component of the total global costs to NSW.’ (Cadence, p. 24)

Hence total Scope 1 and 2 estimated ‘global’ emissions cost of AUD\$111.7m (after an unexplained discount rate of 7%) falls still further to AUD\$0.12m as the total emissions cost of the project for NSW.

This adjustment returns us to the issue of impacts, but does so in a way that bears no relation to climate realities. Emissions from NSW contribute to warming that affects the globe, not just NSW. It is not possible to seal-off NSW so that is only affected by global warming in proportion to its population. The impact on global warming of releasing 260MtCO₂e will be felt in Australia and elsewhere, regardless of population. That is the nature of the global environment: impacts are not divided up nationally, and ‘apportioned’ a component of global costs.

The overall logic is tortuous. Cadence had begun with the total GHG emissions; Scope 3 emissions are excluded as not ‘attributable’ to the mine under UNFCCC rules; the ‘global’ cost of these emissions is then defined in terms of cost of abatement in Australia; a notional 7% discount rate is applied; and finally these costs are ‘apportioned’ only to the NSW population as a proportion of global population. Across the analysis a series of concepts of impacts and responsibility are used interchangeably, with no real bearing on the underlying reality of emissions.

The outcome is that total CO₂e emission from the project are priced by Cadence at AUD\$0.12m. That is about a tenth of a cent per ton of GHG emissions.

Dendrobium GHG Impact – Injustice for the Illawarra

In his presentation the IPC the South32 CEO stated: ‘Our future is the Illawarra’s future’.² This is demonstrably not the case. South32 will not carry the cost of rising GHG emissions from the mine – nor its other impacts. South32’s ‘future’ will clearly benefit from the capacity to extract coal and sell it at a profit. But this will undermine the Illawarra’s climate future.

The huge net cost of the project, in terms of GHG emissions will not be borne by the company: it has stated it will only take responsibility for the impact of Scope 1 and 2 emissions in NSW, and only then as a deflated ERF proxy price, ‘apportioned’ by population to amount to no more than AUD\$120,000 over the life of the project. This clearly commits a gross injustice to the people of the Illawarra.

Section 2 – Transition Futures

Dendrobium Opportunity Costs – ‘Stranded’ Illawarra?

The Project is presented as a necessity for the region’s economy: without it, the export trade and steel industry would collapse, spelling disaster for the region. Yet the Illawarra is not a coal and steel economy: it is a diversified service economy with many strengths in low-carbon sectors. At the last census there were 128,000 workers in the Illawarra, only 2.6%, worked in the mining sector; education employed more than five times more people, at 11% and health even more, at 15%.³

Refusing the Project would not spell disaster for the region – and not even for South32. There are many options for South32 beyond extending the mine. Dendrobium has a decade of production, to 2030, giving the company a long lead-time to diversify from coal in the region. In 2019 South32 stated in its policy document ‘Our Approach to Climate Change’ that ‘we understand that in order to reduce Scope 3 emissions, we need to work together with our customers to support the [energy] transition’.⁴ Not extending Dendrobium would provide the company with an opportunity to do just that.

South32 was formed in 2015 from former coal assets of BHP. In 2018 BHP itself declared it intended to exit the coal sector entirely, as part of its global climate strategy. Like its former parent, Scope32 can diversify from coal, and participate in the energy transition to renewables - not least as it has a stated intent to do so. Announcing the phased just transition for its Dendrobium workforce into the renewable sector would be an important step on this path.

The Project is also positioned as a necessity for Bluescope Steel yet again this is questionable. Only 0.5Mt/year of coal supply from the Dendrobium mine flows to Blue Scope currently a fraction of the proposed output of the mine. There is supply from the mine to 2030 and there are clearly other local mines that could substitute in the near future. In the run-up to and after 2030, Bluescope has the opportunity and incentive to plan for a transition from dependence on coal. The company itself in its 2020 Sustainability Report stated that it ‘aims to identify and prioritise technologies and

² Dendrobium IPC Public Hearing 2 December 2020, p 28, line 2.

³ <https://www.abs.gov.au/>

⁴ https://www.south32.net/docs/default-source/exchange-releases/our-approach-to-climate-change-2019.pdf?sfvrsn=71dfa0ac_2

understand barriers to a net zero future, to create a credible pathway and practical action plan for industry transition'.⁵

Steel production is elsewhere undergoing a global transformation: the DPIE states hydrogen steel-making is 'many many years ahead', yet the International Energy Agency in its 'Iron and Steel Technology Roadmap', released in October 2020, predicts that 30% of steel production will be hydrogen-fuelled by 2050.⁶ In November 2020 BHP predicted an even faster transition, to 50% green hydrogen by 2050.⁷

There are now state-level energy plans being put in place for the decarbonisation of industry, including steel, powered by very cheap renewables. Some states, notably South Australia and Tasmania, are deliberately planning for 200-300% renewable energy in anticipation of a manufacturing boom on the back of cheap renewables and export hydrogen.⁸ The Grattan Institute's 'Start with Steel' report states "the green steel opportunity is both large enough and economically reliable enough to justify policy action... Australia should use the next decade to create a foothold in the emerging green steel market".⁹

There are dangers in being left stranded, dependent on coal for steel in a global context where there is likely to be a heavy premium for 'green steel', and not least to manufacture the new generation of electric vehicles. Such considerations are driving plans for instance being put in place the Baowu-BHP collaboration¹⁰, and by Thyssenkrupp which plans to open a .4Mt steel plant in Germany by 2025, expanding to 3Mt by 2030.¹¹

Another component of the regional economy cited in the reports as threatened by a failure to extend Dendrobium is the coal terminal. The coal terminal is leased to coal companies until 2030 and the wider port clearly has an important future in diversified trade for a new wave of Illawarra manufacturing. A similar realisation has been expressed in Newcastle, where the Newcastle Port acknowledged in 2017 that 'the long-term outlook for coal is a threat to the port' and that there are new roles for the ports in the new decarbonising economy.¹² Again, not exploring these development possibilities leaves the region stranded and sidelined.

Overall, the Illawarra has huge potential future as a renewable-hydrogen hub, linked to premium green manufacturing. The opportunity cost of proceeding with the Dendrobium extension is to delay regional transition for a further 28 years, until 2048, when this proposed extension would finally come to an end.

⁵ <https://www.bluescope.com/about-us/bluescope-news/2020/09/fy2020-bluescope-sustainability-report/>

⁶ <https://www.iea.org/reports/iron-and-steel-technology-roadmap>

⁷ <https://www.bhp.com/media-and-insights/prospects/2020/11/pathways-to-decarbonisation-episode-two-steelmaking-technology/>

⁸ <https://reneweconomy.com.au/south-australia-names-hydrogen-hubs-to-foster-epic-growth-in-wind-and-solar-63661/>; <https://reneweconomy.com.au/tasmania-unveils-action-plan-to-reach-200-per-cent-renewables-92879/>

⁹ <https://grattan.edu.au/report/start-with-steel/>

¹⁰ <https://www.bhp.com/media-and-insights/news-releases/2020/11/bhp-partners-with-china-baowu-to-address-the-challenges-of-climate-change/>

¹¹ <https://www.reuters.com/article/thyssenkrupp-steel-hydrogen-idUSL8N2FU1JN>

¹² <https://www.theguardian.com/environment/2017/dec/18/newcastle-worlds-biggest-coal-export-port-announces-shift-away-from-coal>

CURRICULUM VITAE – PROFESSOR JAMES GOODMAN

James Goodman is Professor and Director of the Climate Justice Research Centre at the University of Technology Sydney. He conducts research into socio-political change, technology and climate justice, drawing from a disciplinary background in political sociology, international relations, political economy and political geography. He has supervised 18 doctoral students to completion, mainly in the area of non-government organisations and international politics, and is currently responsible for a doctoral program under the Climate Justice Research Centre, with ten PhD students (several of whom he is supervising or co-supervising).

He has published five co/authored books and seven edited books, with publishers such as Sage and Routledge. He has edited or co-edited six special issues of journals, such as with the highly-ranked *Energy Research and Social Sciences* (2018), *Energy Policy* (2016), *Global Networks* (2013), and *Globalizations* (2013). He is author or coauthor of 35 book chapters and 32 refereed journal articles and his work has a Google Scholar 'h-index' of 19. Reflecting wider recognition he is regularly invited to write entries for compendia or encyclopaedia, such as the *Routledge Handbook on Climate Justice* (2018), the *Oxford Research Encyclopedia of Climate Science* (2016), the *Sage Handbook of Globalisation* (2014), the *Blackwell Encyclopedia of Social and Political Movements* (2013), and the *International Studies Association Compendium* (2009). He is currently coediting a *Handbook of Transformative Global Studies*, with H. Hosseini and B. Gills (contracted with Routledge for 2019).

Since 2001 he has led four Category 1 projects as CI(1): (i) *Decarbonising Electricity: a Comparison in Socio-ecological Relations* (ARC DP, 8CIs and 3 PIs, \$349k, 2018-21); (ii) *Scholarly Teaching Fellows as a new category of employment in Australian Universities* (OLT Cat 1, 5 CIs, \$277k, 2017-18); (iii) *The Coal Rush and Beyond: Climate Change, Coal Reliance and Contested Futures*, (ARC DP, 5 CIs and 2 PIs, \$540k, 2014-17); (iv) *Chaos, Technology, Global Administration and Daily Life* (ARC DP, 2 CIs and a QE2 Fellow, \$622k, 2008-13). I was also CI2 in *Mapping Justice Globalism: Reassessing the Ideological Landscape of the 21st Century* (DP, 3 CIs, \$273k, 2009-11). All of these projects are inter-disciplinary, several with international PIs, and have led to significant research outputs and impacts.

At UTS he has initiated and led two interdisciplinary research centres. From 2006 he played a central role in creating *Cosmopolitan Civil Societies* research centre, with forty research-active academics, and was its co-Director. Through this he was a founder and editor of the *Journal of Cosmopolitan Civil Societies*, now in its 8th year. In 2017 he established the interdisciplinary *Centre for Climate Justice Research*, with 8 academics and ten PhD students, and several ARC-funded research projects. The Centre promotes research collaborations and for instance in 2017 was awarded an *Academy of Social Sciences* workshop grant focusing on climate and energy transitions. In terms of wider recognition he is on the editorial board of the highly rated international journal, *Globalizations*, am on the international advisory board of the *Globalism Research Centre* at RMIT, and is an executive member of the *Research Committee on Social Movements and Collective Action* at the *International Sociological Association*.

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COMPETITIVE RESEARCH GRANTS

<i>Project ID</i>	<i>Chief Investigators + Partner Investigators</i>	<i>Amount funded</i>	<i>Amount of years</i>	<i>Project title</i>	<i>Outputs</i>
Australian Research Council, Discovery Project DP0880853	Goodman, J. CI (1), Zowghi, J. QE2 Fellow: Marshall, J.	\$622,000	2008-12 (5)	Chaos, technology, administration and daily life	1, 6, 21, 24, 53, 56, 72.
Australian Research Council, Discovery Project DP0984393	Steger, M. CI(1) Goodman, J. Patomaki, H.	\$273,000	2009-11 (3)	Mapping Justice Globalism	3, 6, 19, 22, 25, 51, 57, 71.

Australian Research Council, Discovery Project DP140102606	Goodman, J. CI(1) Connor, L., Ghosh, D., Morton, T., Rosewarne, S. PIs: Renn, O., Chakrabarty, D.	\$540,000	2014-17 (3)	The Coal Rush and Beyond: Climate Change, Coal Reliance and Contested Futures	2, 14, 15, 16, 17 18, 45, 70.
Commonwealth Office for Learning and Teaching, 2016, Strategic Grant	Goodman, J. CI(1) Yasukawa, K., Junor, A., Brown, T., Broadbent, K., Strachan, G.	\$277,000	2016-18 (2)	Scholarly Teaching Fellows as a new category of employment in Australian universities	n/a
Australian Research Council, Discovery Project DP180103868	Goodman, J. CI(1) Connor, L., Ghosh, D., Morton, T., Rosewarne, S., Marshall, J. Bryant, G., Pearse, R. PIs: Renn, O., Chakrabarty, D. Muller, K.	\$349,000	2018-21 (3)	Decarbonising Electricity: a Comparison in Socio-ecological Relations	n/a

Dendrobium Extension

Submission to IPC

Prof J Goodman, UTS

My background

- Speaking on Gadigal lands, never ceded.
- Political Sociologist, University of Technology
- Director, Climate Justice Research Centre, UTS
- Lead author: *'Beyond the Coal Rush: Turning point for Global Energy and Climate policy?'* Cambridge University Press Nov 2020.

NSW Environmental Planning and Assessment - Impact focus

- Objects: (a) 'to promote the social and economic welfare of the community...; (b) 'to facilitate ecologically sustainable development...' (1.3, as amended '17)
- EIS 'The purpose of the EIS is to assess the economic, environmental and social **impacts** of the project...'
- DPEI Dendrobium Assessment: 'weighed environmental **impacts** against socio-economic benefits'

GHG Impacts

- Anticipated *impact* of climate instability drives the Paris goal (to get to net zero by 2050)
- Planned GHG reductions need to triple to meet the 2DegC target (UN 2018)
- From decarbonising electricity to electrifying transport and industry

NSW Rocky Hill Decision – ‘Dire Consequences’ of GHG

- ...greenhouse gas emissions of the coal mine and its coal product will increase global total concentrations of greenhouse gas emissions at a time when what is now urgently needed, in order to meet generally agreed climate targets, is a rapid and deep decrease in greenhouse gas emissions. These ***dire consequences*** should be avoided. The project should be refused.’ (Emphasis added)
- 2019 NSW Land and Environment Court.

GHG from Dendrobium Extension

- +235mt Co2e.
- Scope 1, 2, 3 distinction not relevant for impact: **all** 235mt will warm the planet
- Debate on Scope 3 responsibility is a separate question from impact

Cost of GHG Impact

- Cadence 'Economic Impact Statement' states ERF \$13.52/ton Co₂e is 'proxy to the marginal cost of abatement'
- ERF \$13.52 x 235mtCo₂e = \$3,177m
- The cost of abating project GHG overwhelms claimed benefit of \$1,073m. The project has a net loss of at least \$2,104m

Impact of Project emissions

- Cadence ‘apportion[s] a component of the total global [GHG] costs to NSW’ (p.23)
- Does not reflect the logic of climate change. The climate is global: the impact of GHG on DegC is global.
- The warming impact is the same in NSW as globally.

Impacts and Justice

- South32: 'Our future is the Illawarra's Future'. Well, no.
- In fact South32 as a coal producer is undermining Illawarra's future
- Who bears the huge net net cost of the Project? The people of the Illawarra, and beyond, affected by climate change.
- Who primarily benefits from the project? South32

Alternatives: Decarbonising the Illawarra?

- Illawarra is not a coal economy. It is a diversified service economy
- Census: 293,000 Illawarra Mining 2%, Education 11%, Health 15%
- It has many low-carbon strengths

South32 – Diversified?

- Dendrobium mine 35mt to 2030: a 10 year horizon
- Proposal extends to 2048 against decarbonisation and the renewables–hydrogen boom...
- ‘we understand that in order to reduce Scope 3 emissions, we need to work together with our customers to support the transition. (2019 South32 Approach to Climate Change)
- Can diversify from coal - like its former parent BHP

Bluescope – Transitioning?

- 60% from Dendrobium (1.5mt/yr) Is the extension ‘necessary’? Supply available to 2030 + local substitutes + renewables.
- Bluescope ‘aims to identify and prioritise technologies and understand barriers to a net zero future, to create a credible pathway and practical action plan for industry transition’ (Sustainability Report 2020)
- Diversify sources 2020-30, phase-in renewable hydrogen 2030-50, access ERF

Coal Terminal – Repurposing?

- Reduced output for export - viability threatened?
- Privatised Coal terminal leased to coal companies to 2030.
- Newcastle Port: ‘the long-term outlook for coal is a threat to the port’ (2017). New roles in renewables trade.
- Phase-out coal + phase-in new industries

Reindustrialising the Illawarra?

- Hydrogen steel-making ‘many many years ahead’ (DPIE) yet IEA predicts 30% by 2050 (Iron + Steel Roadmap Oct ‘20) BHP predicts 50% by 2050 (Nov ‘20)
- ‘the green steel opportunity is both large enough and economically credible enough to justify policy action... Australia should use the next decade to create a foothold in the emerging green steel market’ (Grattan Institute ‘20)
- Baowu-BHP; Thyssenkrupp, .4mt by ‘25, 3mt by ‘30
- Illawarra as a renewable-hydrogen hub: premium green manufacturing, A 30-year transition?