

# Expert Report on the Greenhouse Gas and Climate Implications of the Narrabri Gas Project (SSD-6456)

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## ***Response to Additional Material***

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Advice Provided: 21 August 2020

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## Context

1. This report is a response to an extended expert brief provided to me by Environmental Defenders Office (EDO) acting on behalf of North West Alliance. Specifically, I have been asked to look at the additional material that has been provided to the Independent Planning Commission (IPC) in relation to the Narrabri Gas Project (SSD 6456) to judge whether it requires an expert response. I understand that such a response can be submitted to the IPC, which has invited public comment on the new material with a deadline of 5pm AEST on Friday 21 August 2020.
2. I have reviewed Part 31 Division 2 of the *Uniform Civil Procedure Rules 2005* (NSW) and the Expert Witness Code of Conduct which govern the use of expert evidence in NSW Courts, and I agree to be bound by their terms.
3. A brief list of my relevant qualifications follows below. **It should be noted that all points in my submission are made from the standpoint of my expertise, which is science, not law.**

### *Current:*

- Honorary Professor, Climate Change Institute, Australian National University
- Chair, ACT Government Climate Change Council
- Member, Business Advisory Board, ACT Renewable Energy Innovation Fund
- Strategic Scientific Advisor and Principal, *Penny D Sackett Strategic Advisory Services*
- Author of over 135 scientific publications, 65 in refereed journals, together garnering more than 4,300 citations

### *Previous:*

- Member, Scientific Advisory Board, Potsdam Institute for Climate Impact Research
- Chair, Memorandum Team, Nobel Laureate Symposium: *Climate Change, Changing Cities*
- Chief Scientist for Australia (2008-2011)
- Director, Research School of Astronomy and Astrophysics, ANU
- Board of Directors, Association of Universities for Research in Astronomy (AURA)
- Board of Directors, Giant Magellan Telescope Organization (GMTO)
- J Seward Johnson Fellow, Institute of Advanced Study, Princeton, NJ, USA
- PhD in Physics, University of Pittsburgh, USA

## Executive Summary

4. This submission responds to additional material submitted to the IPC by the NSW DPIE and Santos. Several points in those submissions are misleading, irrelevant or misplaced, while other relevant matters are not addressed. My concerns are summarised briefly below. Nothing in the additional material changes my view that the Narrabri Gas Project must not proceed on grounds of environmental and climate considerations, responsible stewardship, and social equity for and safety of future generations.
  - a. The long-term consequences of the Narrabri Gas Project have not been adequately considered, particularly in light of the fact that those consequences will be set into motion by very near-term decisions, such as the possible approval of the Project.
  - b. All fossil fuel production - including coal, oil *and* gas - must decline now (2020) to hold warming to 1.5°C. Coal production must decrease now, and gas and oil production must decline by 2030 to achieve even a 2°C scenario. **This means that *increasing gas development to 'replace' an equivalent amount of coal (in energy content) is not a viable approach to holding warming well-below 2°C, even in the near term to 2030, let alone the longer term over the 25-year lifetime of the proposed Narrabri Gas Project and beyond.***
  - c. Although the Precautionary Principle, which is key to Ecologically Sustainable Development, includes consideration of risk-weighted consequences of various options (according to the *Protection of the Environment Administration Act 1991* (NSW))<sup>1</sup> it is not clear from the NSW DPIE reports at what level of detail the NSW DPIE has made an assessment of risk-weighted consequences of options in their decision making.
  - d. **Four notional trajectories (options) for fossil fuel production, and gas in particular, are set out here in Figure 1 and surrounding text. The risk-weighted consequences of these options, developed by the Intergovernmental Panel on Climate Change (IPCC) in its science-based risk assessments, are presented in Figure 2 and in Table 3, which lists eight key socio-ecological risks associated with increased greenhouse gases.**
  - e. **Continuing on the current path of fossil fuel production, or even the path indicated by current Paris Agreement commitments, is associated with high to very high risk of serious, and some cases irreversible, damage due to anthropogenic climate change.** These directly and adversely affect human health, mortality, livelihoods, critical

infrastructure, food security, and land and marine ecosystems upon which human life depends.

- f. These key socio-ecological risks include those that are and will continue to be felt locally in NSW as global warming increases. It is not evident that the NSW DPIE has considered the Narrabri Gas Project with respect to the changes that can be expected in the region over the next 25 years, as opposed to considering only the current climate.
- g. **Global considerations and international responsibilities inherent in Ecologically Sustainable Development decisions must include, but *per force* must go beyond, Australia's current Nationally Determined Contribution (NDC) pledge, if they are to appropriately safeguard Australia's environment.**
- h. Evidence is presented that expanding gas production beyond current levels works directly to cause a deterioration in the health, diversity and productivity of the environment, both in the lifetime of current generations, and disproportionately so in the lives of those yet to be born. Yet the stated benefits, to the extent that they are applicable at all, are primarily related to energy costs borne by current generations. **The approval of the Narrabri Gas Project would thus violate both the Precautionary Principle and the Principle of Intergenerational Equity.**
- i. In my scientific view, there is nothing in the development application or its assessment by the NSW DPIE that would indicate the benefits of the Narrabri Gas Project are substantial enough that – on balance – they could outweigh the high-risk devastating consequences associated with continued expansion of fossil fuel production. Consequently, **I reject the proposition that the Narrabri Gas Project represents Ecologically Sustainable Development.**
- j. **The argument put by the NSW DPIE that the Project represents a very small fraction of national or global emissions is irrelevant and misleading. If individual consent authorities around the world were to accept this argument and act upon it to approve fossil fuel expansion projects, the climate change predicament would, *per force*, continue to worsen.**
- k. More relevant is the fact that the **direct and indirect emissions from the Narrabri Gas Project, all of which would be emitted in Australia, are very significant when compared to the quantum of emissions reduction required to achieve the stated emissions ambitions of the NSW and Australian Governments by 2030.**

- l. The NSW DPIE argument relating to “existing gas use in East Coast gas market which has been occurring for decades,” is irrelevant since climate action requires reducing, not maintaining, fossil fuel production.
- m. The NSW DPIE argument that Narrabri Gas Project emissions would be “offset” by other Australian or NSW decisions (such as closures of coal-fired stations), is not sufficient from an environmental point of view, even if it were certain that this offset could be directly tied to approval of the proposed Narrabri Gas Project. Total emissions must be decreased, not maintained (that is ‘offset’). **Furthermore, reduction in gas sector and oil emissions must occur *in addition to and simultaneously with very rapid reduction in coal sector emissions in order to hold warming well-below 2°C.***
- n. The statement that a carbon budget analysis does not form the basis of international agreements or local policy misunderstands the application of such an analysis in the Narrabri Gas Project decision. The carbon budget approach is a sound, commonly-used scientific approach that remains valid whether the concept is enacted in policy or not. Its value lies in providing the consent authority perspective on the magnitude of the possible emissions arising from its decision on a local project or activity compared to a reasonable, notional value of the magnitude of the local responsibility.
- o. In fact, **the national Climate Change Authority has used the carbon budget approach extensively to advise on appropriate greenhouse gas targets. Advisory bodies to the Victorian and ACT governments have done the same. In the ACT, the resulting recommendations, based on the carbon budget approach, were codified in law.**
- p. The **NSW DPIE fails to indicate how the ‘polluter pays’ principle will be applied to climate damages related to the increased greenhouse gas emissions associated with the Narrabri Gas Project. These externalities will be borne disproportionately by younger and future generations, with no clear recourse or path to remediation.** Given that any future emissions ‘lock in’ extra warming, there is no possibility for true remediation to current or future generations of the climate damages caused by emissions from Narrabri Gas Project.
- q. In its additional material, Santos states that “gas is the natural partner for renewable energy power generation as Australia and the world transitions towards a low-carbon economy.” **A role for gas is not being disputed here. What is being disputed is that *new gas production* is a tool for reducing emissions consistent with keeping global**

**warming well below 2°C, or that *new* gas is an appropriate ‘substitute fuel’ or ‘transition fuel’ toward net zero emissions by 2050.**

- r. The Santos document repeatedly refers to work by the International Energy Agency (IEA) to support its claim for the need for increased growth in gas. It is shown that many of these statements are inappropriate, misleading and/or misapplied. Specifically, the growth in gas out to 2040 claimed to be consistent with no more than 2°C of warming has already occurred, leaving no room for more growth. Additionally, it is well-known and documented that the IEA has consistently, and dramatically, over two decades, underestimated in its forward projections the rapid uptake of renewables.
- s. Moreover, it is demonstrated that **‘coal-to-gas’ fuel switching was only partially responsible for emissions reductions in the US and UK beginning in the 1990s, and that coal-to-renewables and demand side changes are now more effective in causing domestic emission reductions in those countries.** ‘Fuel switching’ from coal to gas is policy based on factors that were at play around the turn of the century, not in world of 2015 and beyond.
- t. From a scientific perspective, **I challenge Mr Lancaster SC’s assertion (Appendix B of the Santos response) that the Narrabri Gas Project likely passes the conservation of reasonable and equitable access principle. Current generations have and have had unparalleled access to fossil fuels, whilst younger and future generations will have to weigh their access against the growing risks of global warming associated with fossil fuel use.** Until such a time that extraction of those resources can be done in a manner that does not endanger them or the natural environment on which they will depend, I contend that the coal seam gas that would be extracted by the Narrabri Gas Project must stay in the ground.

## The Department 'Response to IPC Questions' 14 Aug 2020

5. The New South Wales Department of Planning, Industry and Environment (NSW DPIE) submitted a document entitled 'Narrabri Gas Project (SSD 6456), Response to Independent Planning Commission Questions.'<sup>2</sup> The Department's remarks under the heading "Ecological Sustainable Development" are the subject of this section of my response.
6. On page 3 of its response, the **NSW DPIE concludes that the Narrabri Gas Project represents Ecologically Sustainable Development (ESD). I disagree with that conclusion.**
7. **Two definitions and descriptions of ESD** (described below) **appear pertinent to this development application**; I have used them to inform this submission.

Table 1	National Strategy for Ecologically Sustainable Development <sup>3</sup>
Definition of ESD	Using, conserving and enhancing the community's resources so <b>that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.</b>
Features of ESD approach	<ul style="list-style-type: none"> <li>• <b>consider, in an integrated way, the wider economic, social and environmental implications of our decisions and actions for Australia, the international community and the biosphere;</b> and</li> <li>• <b>take a long-term rather than short-term view</b> when taking those decisions and actions.</li> </ul>
Core Objectives	<ul style="list-style-type: none"> <li>• enhance individual and community well-being and welfare by following a <b>path of economic development that safeguards the welfare of future generations</b></li> <li>• <b>provide for equity within and between generations</b></li> <li>• protect biological diversity and <b>maintain essential ecological processes and life-support systems</b></li> </ul>
Guiding Principles	<ul style="list-style-type: none"> <li>• decision making processes should <b>effectively integrate both long and short-term economic, environmental, social and equity considerations</b></li> <li>• <b>where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation</b></li> <li>• <b>the global dimension of environmental impacts of actions and policies should be recognised and considered</b></li> <li>• <b>the need to develop a strong, growing and diversified economy which can enhance the capacity for environmental protection</b> should be recognised</li> <li>• <b>the need to maintain and enhance international competitiveness in an environmentally sound manner</b> should be recognised</li> <li>• cost effective and flexible policy instruments should be adopted, such as improved valuation, pricing and incentive mechanisms</li> <li>• decisions and actions should provide for broad community involvement on issues which affect them</li> </ul>

8. First, the **National Strategy for Ecologically Sustainable Development**<sup>4</sup> states its goal as “Development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends.” To that end, the Strategy defines ESD, outlines principles of an ESD approach, and lists core objectives and guiding principles of the Strategy, which are reproduced in Table 1 above. The Strategy further states that the guiding principles and core objectives should be considered as a package, with a balanced approach so that no objective or principle predominates over the others.
9. Second, the **Protection of the Environment Administration Act 1991 (NSW)**,<sup>5</sup> in establishing the NSW Environment Protection Agency, gives the first objective of that Agency as “to protect, restore and enhance the quality of the environment in New South Wales, having regard to the need to maintain ecologically sustainable development.” The Act sets out several principles and programs by which ESD can be achieved, which are reproduced in Table 2 below.

Table 2	<b>NSW Protection of the Environment Administration Act 1991</b> <sup>6</sup>
Guiding Principles	<p>(a) <b>the precautionary principle—namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.</b></p> <p>In the application of the <b>precautionary principle, public and private decisions</b> should be guided by:</p> <ul style="list-style-type: none"> <li>(i) careful evaluation to <b>avoid, wherever practicable, serious or irreversible damage to the environment,</b> and</li> <li>(ii) an <b>assessment of the risk-weighted consequences of various options,</b></li> </ul> <p>(b) <b>inter-generational equity—namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,</b></p> <p>(c) conservation of biological diversity and ecological integrity—namely, that <b>conservation of biological diversity and ecological integrity should be a fundamental consideration,</b></p> <p>(d) improved valuation, pricing and incentive mechanisms—namely, that environmental factors should be included in the valuation of assets and services, such as:</p> <ul style="list-style-type: none"> <li>(i) <b>polluter pays—that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,</b></li> <li>(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,</li> <li>(iii) environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.</li> </ul>

10. In what follows, I focus on how anthropogenic climate change, brought on primarily by human use of fossil fuels, and the climate change that can be expected in future by continuing current trends, relates to the defining characteristics of Ecologically Sustainable Development (ESD) as set out in Tables 1 and 2, from a scientific perspective. A more general description of anthropogenic climate change itself, its relationship to greenhouse gases and the use of fossil fuels, and the need to end new fossil fuel development in order to meet the objective of the UN Paris Agreement, is given in my previous submission to the IPC on the Narrabri Gas Project<sup>7</sup>.

### *Consideration of the Long Term*

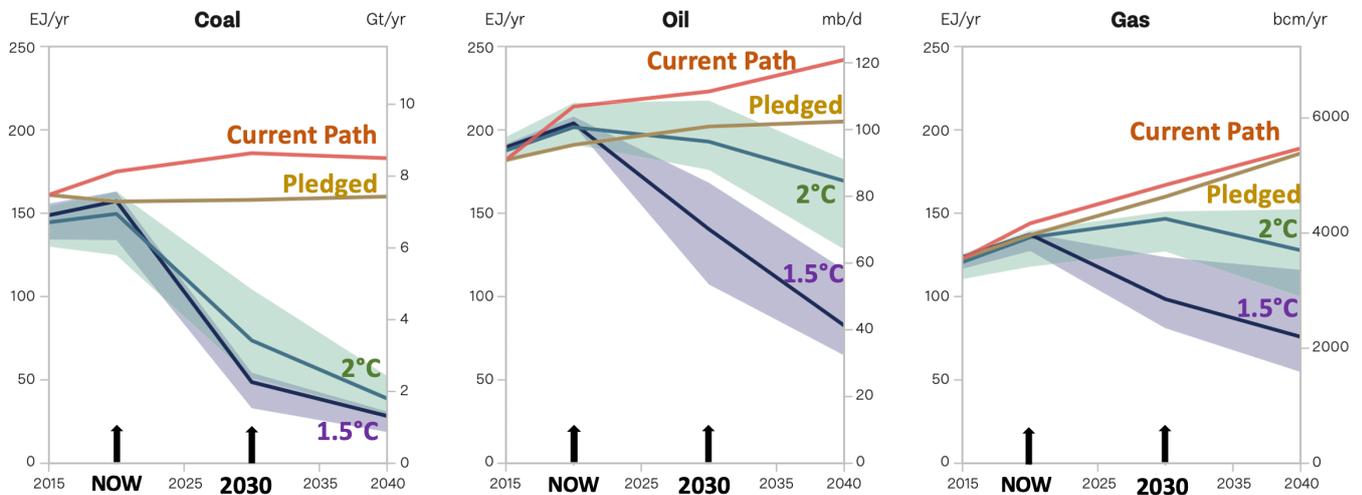
11. What constitutes short term vs long term depends on context, but the principles of ESD clearly call for special consideration of the long term. Long-term thinking is mentioned explicitly in the documents referenced in Tables 1 and 2, and reinforced by use of the terms ‘conservation’ and ‘sustainable’, and an emphasis on the future environment and future generations.
12. **Timeframes that might be considered “distant” under other circumstances are crucial to climate change considerations**, because the full climatic effects of greenhouse gases (especially CO<sub>2</sub>) are not felt until long after the time of emission. Furthermore, there is the possibility that these longer-term effects could include crossing tipping points that would make some aspects of climate change irreversible.
13. Importantly, **quite short time scales are also crucial when considering the effects of climate change**, because the lag between the full effects of emissions and the global warming they cause means that what we do this year, has consequences for every year thereafter in the foreseeable future.
14. With respect to climate change, and the proposed Narrabri Gas Project’s role in it, at least three time frames are relevant: now until around 2030 (short-term, during which action will be pivotal to holding warming below 2°C), around 2045 – 2050 (medium term, the lifetime of the Project and timeframe of NSW’s net zero emission target), and the period of 2100 and beyond (long term, which this writer will not experience, but a child born today in Australia might be expected to witness).
15. It is not possible to predict all the possible futures that might happen if the Narrabri Gas Project were approved, or if it were not approved. However, given that implications of this decision are to take into account (Table 1) implications for “Australia, the international community and

the biosphere,” it is **instructive to estimate the short- and longer-term climate consequences should the world, with Australia as an example, follow one of several broad trajectories with respect to fossil fuel production.** This is relevant when considering emissions, which act globally and cumulatively to create climate change.

16. Specifically, considered here are the trajectories described in a recent multi-institutional report led by the Swedish Environment Institute (SEI) that analyses the gap between different nations’ expectations for the production of fossil fuels and the Paris Agreement targets that the same nations support (SEI et al., 2019).<sup>8</sup>

17. **The disconnect between the intention to produce more fossil fuels and the commitment to reduce emissions has been called the “Production Gap.”** Australia is a major contributor to this gap<sup>9</sup> between global intended production of different fossil fuels and the Paris Agreement target range, as shown in Figure 1 below, taken from the SEI report<sup>10</sup>.

18. The SEI analysis shows that governments are planning to produce approximately 50% more fossil fuels by 2030 than would be consistent with a 2°C pathway and 120% more than would be consistent with a 1.5°C pathway. **This means that plans for fossil fuel development or extension that are *already on the table* must be shelved to hold warming to Paris targets.**



*Figure 1: Trajectories of possible fossil fuel production from 2015 to 2040 are shown separately for coal (right), oil (centre) and gas (left). In red is the current trajectory, whilst the gold line indicates what would be achieved if all Paris Agreement pledges were met. Lavender and turquoise trajectories reflect world coal, oil and gas production consistent with a 66% chance of holding warming to 1.5°C and 2.0°C, respectively. Shaded regions indicate uncertainty ranges for the 1.5°C and 2.0°C trajectories. Note that **each fossil fuel must separately stay within its shaded zones to achieve the 1.5°C or 2.0°C global warming scenarios.***

19. **Redressing this fossil fuel production gap cannot be met by *adding* fossil fuel development, even that which may have already planned. Instead, **new fossil fuel development and****

**expansion must cease, and ageing facilities brought to rapid close.** In fact, a recent economic analysis **based on only a 50% chance of achieving 2°C** scenario (equivalent to flipping a coin) concluded that **half of all gas reserves must remain unused from 2010 to 2050 in order to meet a target of 2°C** (McGlade and Ekins, 2015),<sup>11</sup> specifically including reserves held by OEDC countries in the Pacific, of which Australia is the major player.

20. Trajectories for gas may decline slower than oil or coal to achieve the overall trajectories shown in Figure 1, but **gas must still decline around 2020 (under a 1.5°C pathway) or around 2030 (under a 2°C pathway).**<sup>12</sup>
21. **Critically, the SEI Report shows all fossil fuel production, coal, oil and gas must decline now (2020) to hold warming to 1.5°C, and decline by 2030 to achieve even a 2°C scenario.** This means that *increasing gas development to “replace” an equivalent amount of coal (in energy content) is not a viable approach to holding warming to well-below 2°C, even in the near term* to 2030, let alone the longer term over the 25-year lifetime of the proposed Narrabri Gas Project and beyond.
22. Furthermore, to the extent that coal or oil do not follow their 1.5°C or 2.0°C trajectories, gas will need to decline even faster. Note that what is required is reduction of the *production* of each of these fossil fuels to meet the Paris Agreement goal of well below 2.0°C of warming; where the fuels are actually combusted is of no consequence to future climate change.

### *Consideration of Risk-weighted Consequences of Various Options*

23. Although **the Precautionary Principle, which is key to ESD, includes consideration of risk-weighted consequences of various options** (according to the *Protection of the Environment Administration Act 1991* (NSW))<sup>13</sup> **it is not clear from its reports at what level of detail the NSW DPIE has made such an assessment.**
24. Acknowledging that such an assessment would be complex, the **focus here is to consider the climate change implications of four possible options**, that might notionally be taken by NSW, Australia, and the rest of the world. Namely:
  - a. Reducing each type of fossil fuel production between now and 2040 at rates consistent with holding warming to **1.5°C (lavender line in Figure 1)**;
  - b. Reducing each type of fossil fuel production between now and 2040 at rates consistent with holding warming to **2.0°C (turquoise line in Figure 1)**;

- c. Continuing on the “pledged” path of current Nationally Determined Contributions (NDCs) to the Paris Agreement (**gold** line in Figure 1), estimated to cause between **2.9°C and 3.4°C** by 2100, and increasing continuing thereafter (WMO 2019)<sup>14</sup>; or
  - d. Continuing on the current path (**red** line in Figure 1) unabated, similar to the scenarios<sup>15</sup> labeled RCP6.0 and RCP8.5 by the IPCC (Collins et al. 2013<sup>16</sup>, based on extrapolation of observed emissions trend in Le Quéré et al. 2018<sup>17</sup>, and consistent with Climate Action Tracker, 2019<sup>18</sup>) which could lead to **4°C or more** by 2100 (Climate Action Tracker, 2019)<sup>19</sup>.
25. In order to assess the risk-weighted consequences of these four notional trajectories, we use the Intergovernmental Panel on Climate Change (IPCC) science-based risk assessments for people, ecosystems and economies worldwide as a function of global warming above pre-industrial standards.
26. Possible options with respect to fossil fuel production are presented in Figure 1, and the climate change risk-assessed consequences of those options are illustrated in Figure 2, below, based on work (O’Neill et al. 2017)<sup>20</sup> summarising and analysing the detailed assessments of the fifth IPCC Working Group II Report<sup>21</sup>.

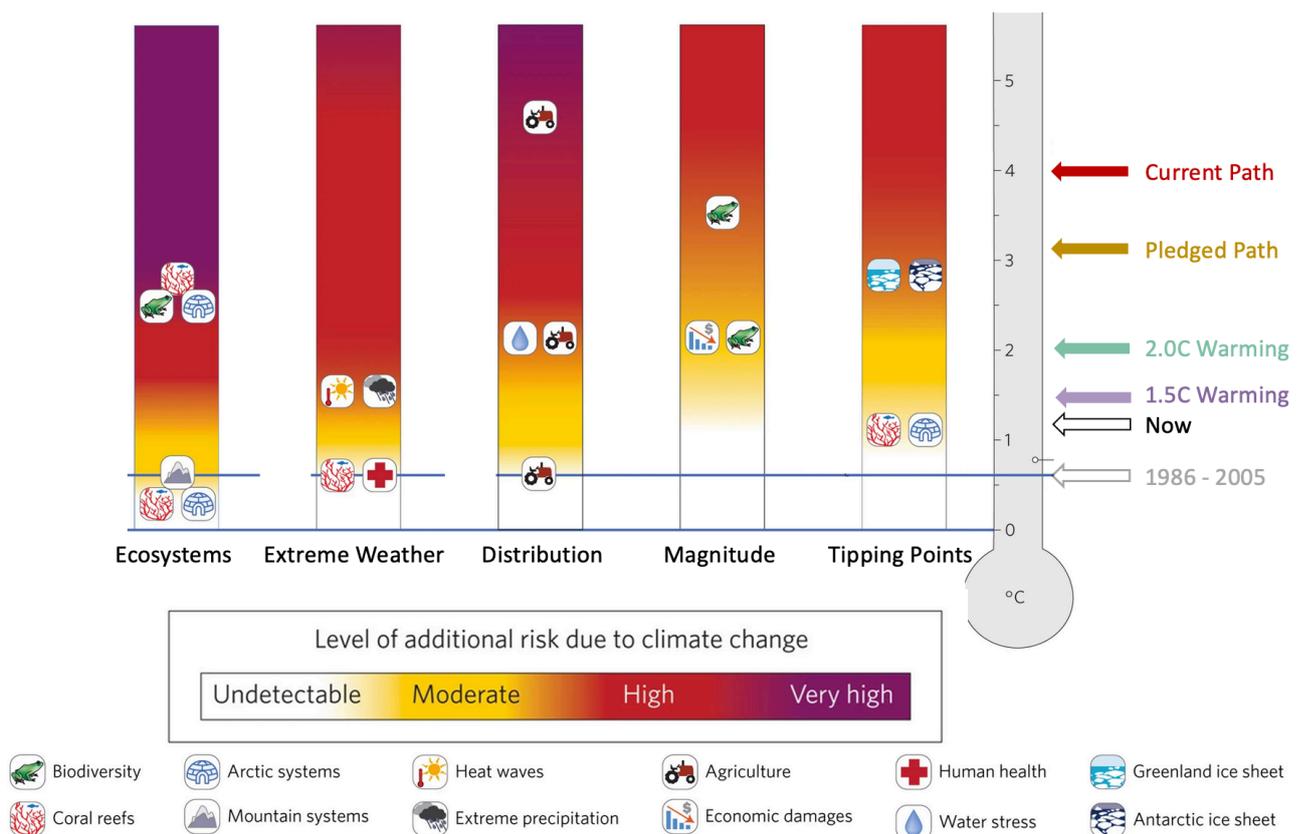


Figure 2: Colour-coded levels of risk associated with 5 different **Reasons for Concern** are illustrated for increasing global mean temperature and are the same as those presented in the IPCC Working Group II report<sup>22</sup>. This figure from O’Neill et al. (2017)<sup>23</sup> has been modified to indicate with the horizontal arrows the warming levels expected by 2100 corresponding to the four choices of fossil fuel production shown in Figure 1, so that climate risks associated with the options can be assessed.

27. In Figure 2, the level of risk for five different “Reasons for Concern” is shown, as a function of global warming, which is to say, as a function of the choices that humanity makes about fossil fuel trajectories, especially over the next 10-20 years. These risks are grouped according to whether they related to unique and threatened systems (RC1), extreme weather events (RC2), the distribution of impacts across the Earth (RC3), the magnitude of the aggregated impact (RC4), and the crossing of critical thresholds (or tipping points, RC5). These categories are not exclusive, but overlap in their impact on human well-being, as shown in Table 3.
28. Already now, in 2020, we are experiencing moderately high levels of risk to coral reefs, mountain systems (including glaciers) and arctic systems. Extreme weather is associated with moderate risk to coral reefs and human health. Agriculture is experiencing moderate levels of risk associated with the global distribution, and coral reefs and arctic systems are moving toward tipping points. **Even now, at 1.1° - 1.2°C of warming, the world is not `safe.`**
29. At 1.5°C to 2.0°C of warming, these risks increase, and in addition, there is high risk of heat waves and extreme precipitation, moderately to moderately high risk of water and agriculture stress, and increased risk of economic damages and biodiversity loss. **At 2°C warming, global coral reefs, including the Great Barrier Reef, are very likely to be eliminated (IPCC SR1.5).**<sup>24</sup>
30. If all nations “just” kept their current Paris Agreement pledges, the world would be an even more dramatically risky and altered place. Very high risk of severe impact to unique ecosystems would ensue, and the Antarctic and Greenland ice sheets would be at moderately high risk of crossing a permanent melting threshold, causing enormous, rapid sea level rise.
31. Because the Earth is a connected system, **risk in one region, to one species, or in one element affects all others.** Table 3, on the next page, sets out **8 key risks to human well-being**, so chosen because of the high probability of significant risk materialising, the large magnitude of associated consequences, persistent vulnerability or exposure to the impacts, or their irreversibility, and limited potential to reduce the risk (O’Neill et al. 2017).<sup>25</sup>

**Table 3: Eight key risks to human well-being identified in Working Group II IPCC Report 2014** <sup>26</sup>

Serious Socio-Ecological Risks Associated with Climate Change	Reason for Concern (Pillars of Fig 2)				
	1	2	3	4	5
<b>Death, injury, ill-health, or disrupted livelihoods in low-lying coastal zones</b> and small island developing states and other small islands due to storm surges, coastal flooding, and sea-level rise	√	√	√	√	√
<b>Severe ill-health and disrupted livelihoods for large urban populations</b> due to inland flooding in some regions		√	√		
<b>Extreme weather events leading to breakdown of infrastructure networks</b> and critical services such as electricity, water supply, and health and emergency services		√	√	√	
<b>Mortality and morbidity during periods of extreme heat</b> , particularly for vulnerable urban populations and those working outdoors in urban or rural areas		√	√		
<b>Food insecurity and the breakdown of food systems</b> linked to warming, drought, flooding, and precipitation variability and extremes, particularly for poorer populations in urban and rural settings		√	√	√	
<b>Loss of rural livelihoods and income due to insufficient access to drinking and irrigation water</b> and reduced agricultural productivity, particularly for farmers and pastoralists with minimal capital in semi-arid regions		√	√		
<b>Loss of marine and coastal ecosystems, biodiversity, and the ecosystem goods, functions, and services they provide</b> for coastal livelihoods, especially for fishing communities in the tropics and the Arctic	√	√		√	√
<b>Loss of terrestrial and inland water ecosystems, biodiversity, and the ecosystem goods, functions, and services they provide</b> for livelihoods	√		√	√	

32. It must be noted that climate **impacts are hitting harder and sooner than even the Intergovernmental Panel on Climate Change (IPCC) fifth assessment anticipated**. In its recent special report (SR1.5 2018, Fig 1.5),<sup>27</sup> any particular degree of risk to unique and threatened systems (RC1) or to crossing tipping points (RC5) is estimated to occur at even lower temperatures than shown in Figure 2 above.

### *Specific Local Consequences*

33. The growing risks of devastating effects from climate change differ for different places on the globe. Two (out of many) specific high-risk local consequences for NSW of continuing to expand fossil fuel production are quantified below, namely water availability for agriculture and the risk of catastrophic bushfire.

34. **Rainfall on the most recent 2- to 3-year timescales in northern inland New South Wales, containing the Narrabri region, has been near or below previous record low values<sup>28</sup>**, many of them set during the Federation Drought in 1900–1902. The extent and timing of the dry conditions meant **that agriculture was particularly affected, with the top 100cm of soil at record moisture lows at** many locations, including Narrabri. This is the current situation.
35. **For NSW, run-off, that is the water available to feed dams and rivers, will decrease markedly with the multiple effects of climate change.** It is estimated<sup>29</sup> that for every one degree (°C) of global warming, runoff will be reduced by 15%, which matches what is currently being experienced. **With current emissions trends leading to a possible *additional* 2°C to 3°C of temperature increase (for a total increase of 3°C to 4°C), the NSW region could be faced with useable water reductions of 45 – 60%, compared to mid last century<sup>30</sup>.** This has **profound consequences for water availability for human and environmental use, and thus for the interaction of the proposed Narrabri Gas Project with agriculture.** It is not evident that this regional risk has been considered by NSW DPIE in its assessment.
36. **The 2019/20 bushfires that have just devastated so much of NSW were the worst on record on many measures (Hughes et al 2020),<sup>31</sup> and can expected to become more frequent.** A first analysis<sup>32</sup> suggests that the fire weather associated with this type of bushfire has *already* increased at least 30% since 1900 due to climate change, and that **similar fire danger weather would be at least four times more likely if global warming reaches 2°C. The enormous risk of catastrophic fires to the region at global warming of 3°C to 4°C is almost unimaginable.** This risk must be assessed in development decisions such as the Narrabri Gas Project that would expand fossil fuel production in a way consistent with a warming scenario above 2°C.

### *Global Implications and International Responsibilities*

37. Global implications and responsibilities of protecting the environment — an environment that is increasingly threatened by climate change that expanded fossil fuel production induces — are a key component of Australian environmental strategies and laws. The National Strategy for Ecologically Sustainable Development<sup>33</sup> includes as a guiding principle that “the global dimension of environmental impacts of actions and policies should be recognised and considered.”
38. In light of this, **the extent to which the world at large is threatened by the socio-ecological risks associated with climate change (Table 3) should be considered in a development**

**decision on the Narrabri Gas Project. It is not clear that NSW DPIE has executed this consideration.**

39. As the arguments presented in this submission and my earlier submission<sup>34</sup> detail, **pursing a path that increases fossil fuel production is inconsistent with the key stated aim of the Paris Agreement, to which Australia is a signatory. That this applies to increased gas production specifically is illustrated by the 'production gap' illustrated in Figure 1.**
40. On page 6 of its "*Response to IPC Questions*" response, NSW DPIE acknowledges that "Climate change is a critical global issue requiring urgent action, and the success of this action will be essential for ensuring intergenerational equity." The NSW DPIE response goes on to state that the "responsibility for reducing greenhouse gas emissions and addressing climate change is spread across the globe and global action is driven principally through the Paris Agreement."
41. In my view, it is not at all clear that global action is driven "principally through the Paris Agreement." Private enterprise, financial investment, the rapidly falling price of renewables, public opinion, and actions and decisions by sub-national governments have all contributed greatly to the first steps in addressing climate change. Therefore, **I reject the notion that action on climate change is principally an international undertaking, particularly if it is used to shift responsibility away from local decisions that contribute to increasing emissions.**
42. Furthermore, the Nationally Determined Contributions (NDCs) made by individual signatory nations to meet the Paris Agreement goals are not consistent with the urgent climate action required to ensure the intergenerational equity that NSW DPIE mentions in its response submission.
43. At present, it is estimated that the **current NDCs, if achieved, would result in global warming between 2.9°C and 3.4°C** by 2100 relative to pre-industrial levels, and continuing thereafter (WMO 2019)<sup>35</sup>. That is, **current commitments are not sufficient to hold warming to 2°C, let alone well below 2°C. Current levels of NDC ambition must be roughly tripled for global emission reduction to be in line with even a 2°C scenario** (WMO 2019)<sup>36</sup>.
44. Despite this, **most nations are not on-track to meet their current commitments**, which if not corrected immediately, will result in even more warming.
45. The conclusion is that **global considerations should be taken into account in a decision about the proposed Narrabri Gas Project, and that these considerations include, but *per force* must go beyond, Australia's current NDC pledge.**

## *The Precautionary Principle and the Inter-generational Equity*

46. The relationship between greenhouse gas emissions from fossil fuels and the risk-weighted consequences of various options for their further development provides a context for the use of the Precautionary Principle and the Principle of Inter-generational Equity in the development decision of the proposed Narrabri Gas Project.
47. The Precautionary Principle states that **“where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.”** It one of the guiding principles in National Strategy for Ecologically Sustainable Development<sup>37</sup> and the *Protection of the Environment Administration Act 1991 (NSW)*.<sup>38</sup>
48. The *Protection of the Environment Administration Act 1991 (NSW)*<sup>39</sup> advises that in applying the Precautionary Principle public and private decisions should be guided by:
- (i) careful evaluation to **avoid, wherever practicable, serious or irreversible damage to the environment**, and
  - (ii) an **assessment of the risk-weighted consequences of various options**.
49. As shown by comparing Figures 1 and 2, whilst referencing Table 3, **continuing on the current path of fossil fuel production, or even the path indicated by current Paris Agreement commitments, is associated with high to very high risk of serious, and some cases irreversible, damage due to anthropogenic climate change.** These directly and adversely affect **human health, mortality, livelihoods, critical infrastructure, food security, and land and marine ecosystems upon which human life depends.**
50. An assessment of the risk-weighted consequences of various options for fossil fuel production trajectories (Figures 1 and 2) indicate that **highest risk of the worst possible outcomes for the climate-human interaction can be avoided by adopting a pathway consistent with holding global warming well-below 2°C.** Such pathways do not allow the growth of gas production in the next 10 years, let alone over the lifetime of the proposed Narrabri Gas Project.
51. Importantly, **increases in global fossil fuel production increase the risk that tipping points<sup>40</sup> may be crossed that would cause subsystems of the Earth to rapidly collapse, one initiating another, to create a cascade of transformations that result in what has been dubbed a “Hothouse Earth”<sup>41</sup>.** In this future, average temperatures will rise to match those not seen since the beginning of the Stone Age, millions of years ago, with devastating consequences. It

is uncertain precisely where this “Hothouse” threshold lies, but it could be as close as a few decades away, that is, at or just beyond 2°C of warming<sup>42</sup>.

52. The Inter-generational Equity Principle states that **“that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.”** It one of the core principles in National Strategy for Ecologically Sustainable Development<sup>43</sup> and the *Protection of the Environment Administration Act 1991* (NSW).<sup>44</sup>
53. In every aspect, the analysis presented in this section has shown that **expanding gas production beyond current levels works directly to cause a deterioration in the health, diversity and productivity of the environment**, both in the life time of current generations, and **disproportionately so in the lives of those yet to be born. Yet the stated benefits of the Narrabri Gas Project**, to the extent that they are applicable at all, **are primarily related to energy costs borne by current generations.**
54. The conclusion is that **the approval of the Narrabri Gas Project would violate both the Precautionary Principle and the Principle of Intergenerational Equity.**
55. Further, in my view, the needs expressed as guiding principles in the National Strategy for Ecologically Sustainable Development<sup>45</sup> to:
- a. develop a strong, growing and diversified economy **which can enhance the capacity for environmental protection**
  - b. the need to maintain and enhance international competitiveness **in an environmentally sound manner**
- both point in the direction of disallowing new fossil fuel development, as there are other means of meeting energy needs that would better satisfy these principles.
56. In sum, **in my scientific view, there is nothing in the development application or its assessment by the NSW DPIE that would indicate that the Project benefits are substantial enough that – on balance – they could outweigh the high-risk devastating consequences associated with continued expansion of fossil fuel production including the Narrabri Gas Project**, or indeed, that the Project is in any way ‘necessary.’ In this sense, **I reject the proposition that the Narrabri Gas Project represents Ecologically Sustainable Development.**

### *Greenhouse Gas Emissions of the Narrabri Gas Project and “Offsetting”*

57. On page 4 of its response to IPC questions, NSW DPIE states that the Narrabri Gas Project **“would not generate significant greenhouse gas emissions** either incrementally or in a

cumulative sense, particularly when you consider that it would be used to **sustain existing gas use in East Coast gas market which has been occurring for decades**, and is **likely to be more than offset by a range of other initiatives** in NSW that are being pursued by the State and Commonwealth governments as well as the private sector.”

58. This statement contains **three misconceptions or misleading statements**, each of which are addressed below.
59. First, **comparison of the emissions from a proposed project to the total current emissions from a nation or the world is inappropriate** for decision making because it **(a) ignores that the goal is to reduce emissions, not maintain them, and because (b) the nature of the climate change issue is that emissions come from a large number of individual sources, each of which supply a small fraction of the total.**
60. If the world as a whole were to accept the argument that a particular project development, such as the Narrabri Gas Project, cannot be denied on the basis that it would emit only a small fraction of the world’s emissions, the climate change predicament would, *per force*, continue to worsen. It is an irrelevant, and given the consequences, dangerous proposition to put when dealing with a collective global risk caused by a large number of small sources.
61. Furthermore, as detailed in my previous submission<sup>46</sup>, **the direct and indirect emissions from the Narrabri Gas Project, all of which will be emitted in Australia, are very significant when compared to the quantum of emissions reduction required to achieve the stated emissions ambitions of the NSW and Australian Governments.**
62. **Narrabri Gas Project emissions over its first 10 years of life would equal about 12% (in the opposite direction) of Australia’s total abatement task<sup>47</sup> of 395—462 MtCO<sub>2</sub>-e to meet its 2030 target. For NSW to meet its own declared 2030 target, a total abatement of 56 MtCO<sub>2</sub>-e will need to be found in the next 10 years; the NGP would fight against this by *adding* a very significant 6 to 11 MtCO<sub>2</sub>-e (11% – 19% of the NSW abatement task) over this period.**
63. Another measure to consider is the amount of *new, previously unaddressed* emissions that must be brought to zero every year to meet 2030 targets. The Australian 2030 target, if approached linearly, requires an average *new reduction* of 7.4 Mt CO<sub>2</sub>-e per year, year on year, from 2018 to 2030. That is, **to meet its stated 2030 Paris commitment, Australia would need to – each year – not only maintain its reduction from the previous years, but find *further* reduction of 7.4 MtCO<sub>2</sub>-e each year to 2030. In comparison, the Narrabri Gas Project would *add* more 4.8 – 5.1 MtCO<sub>2</sub>-e every year, and continue to add that annual amount for the years 2031 – 2045.**

64. Meeting NSW's own 2030 target will require an annual new *reduction* of about 2.4 MtCO<sub>2</sub>-e per year, year on year, whereas the Narrabri Gas Project would *add* at least 0.6 MtCO<sub>2</sub>-e every year, thus working in the *opposite direction* and nulling 26 – 44% of the intended reductions in all other areas of NSW industry and commerce every year. This *excludes* emissions from any Narrabri Gas Project gas used in gas plants within the State.
65. The conclusion is that **emissions from the proposed Narrabri Gas Project represent a very significant amount of the emissions that NSW and Australia will be attempting to *reduce* in order to meet their stated 2030 emissions targets.**
66. Second, **sustaining “existing gas use in East Coast gas market which has been occurring for decades,” is incompatible with holding global warming to well-below 2°C**, as previously discussed, and illustrated by Figure 1.
67. Third, **it is not sufficient from an environmental point of view, to “offset” emissions**, even if it were proven that this offset was directly tied to approval of the proposed Narrabri Gas Project. **Emissions must be decreased, not maintained.** Furthermore, as Figure 1 illustrates, and discussion surrounding it details, **reduction in gas sector and oil emissions must occur *in addition to and simultaneously with* very rapid reduction in coal sector emissions in order to hold warming well-below 2°C.**

### *Carbon Budget Approach*

68. On page 7 of its response to IPC questions, NSW DPIE states *“Several groups have advocated for the adoption of a ‘carbon budget’, both globally and at a national and regional level, and for its use in the assessment of the Narrabri Gas Project. However, carbon budgets have not be [sic] adopted in any international agreements on climate change and there is no policy support for their use in Australia or NSW. While they provide useful tools for policy analysis, there are significant conceptual difficulties with developing carbon budgets for countries and regions within countries, such as NSW, and using them to assess the merits of individual projects. Consequently, the Department does not support the use of the carbon budget approach to the Narrabri Gas Project.”* **This statement indicates a misunderstanding and/or misstatement of the relevance of the ‘carbon budget’ approach to the Narrabri Gas Project.**
69. The carbon budget approach connects the cumulative amount of carbon emissions over all time to the level of heating of the planet. It is a sound, commonly-used scientific approach to understand the magnitude and speed with which greenhouse gas emissions must be curtailed in order to meet a given global warming goal. **Put simply, the rise in global temperature is**

**approximately proportional to the cumulative amount of global carbon emissions, regardless of where or by whom they are emitted. This remains true whether the concept is adopted and enacted in policy or not.**

70. That said, it bears noting, that the IPCC reports<sup>48</sup> that inform the UNFCCC have used the carbon budget approach to assess a variety of scenarios for global emissions and the resulting global warming.
71. The value of the carbon budget approach applied to national or local decisions is to place in context the magnitude of carbon emissions arising from a given activity or project under the jurisdiction of a local agent or subnational jurisdiction (such as the NSW government), compared to the 'notional local share' of the remaining global carbon budget of humanity as a whole. **The national Climate Change Authority<sup>49</sup> has used this approach extensively to advise on appropriate greenhouse gas targets. Advisory bodies to the Victorian<sup>50</sup> and ACT<sup>51</sup> governments have done the same. In the ACT, the recommendations, based on the carbon budget approach, were codified in law<sup>52</sup>.** The assignment of a 'local carbon budget' to local sub-entities or subnational jurisdictions can be made in a variety of ways, and in this sense is subjective. In my previous submission<sup>53</sup> to the IPC on the Narrabri Gas Project, I chose to make the assignment on a per capita basis.
72. The aim in providing the context of a 'notional local share' of the global carbon budget is to give the consent authority perspective on the size of the possible emissions arising from its decision on a local project or activity compared to a reasonable, notional value of the size of the local responsibility.

### *Polluter Pays Principle*

73. On page 9 of its response to IPC questions, the NSW DPIE raises the Principle of "Polluter Pays," as appears, for example, in the *Protection of the Environment Administration Act 1991* (NSW).<sup>54</sup> **The Department fails to address, however, how the 'polluter,' whether one considers the polluter to be the miner and/or the entity responsible for the gas combustion, would pay for climate damages related to the increased greenhouse gas emissions associated with the Narrabri Gas Project.**
74. Given that any future emissions "lock in" extra warming, there is no possibility for true "remediation" to current or future generations of the climate damages caused by emissions from Narrabri Gas Project. What is clear, is that NSW is the jurisdiction that can definitely stop these emissions from occurring in the first place.

## Santos' 'Submission to IPC following public hearing' 10 Aug 2020

75. Santos, the applicant with respect to the Narrabri Gas Project, submitted a document<sup>55</sup> entitled 'Narrabri Gas Project (SSD 6456), Submission to IPC following public hearing, dated 10 Aug 2020,' the contents of which are the subject of this section. Here, I respond to Section 3 of this Santos document. In the next section, I respond to Section 4 of the Santos document, which refers to the opinion of Richard Lancaster SC, submitted as Appendix B.

### *The role of natural gas in a low-carbon economy*

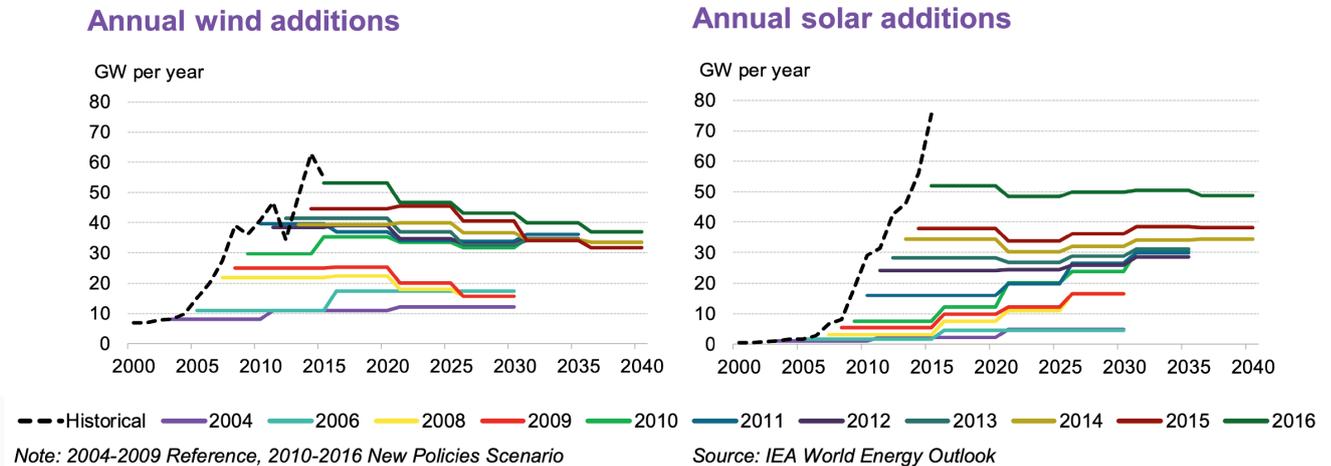
76. On page 9 of their submission, Santos states that "gas is the natural partner for renewable energy power generation as Australia and the world transitions towards a low-carbon economy." **A role for gas is not being disputed here. What is being disputed is *new gas production* as a tool for reducing emissions consistent with keeping global warming well below 2°C, or that new gas is an appropriate 'substitute fuel' or 'transition fuel' toward net zero emissions by 2050.**

77. The Santos document repeatedly refers to work by the International Energy Agency (IEA) to support its claim for the need for increased growth in gas. These statements are **inappropriate, misleading and/or misapplied.** Paragraphs 78, 79, 80 and 81 below give examples.

78. On page 9, Santos repeats the statement "**Under an International Energy Agency scenario consistent with the 2°C target, global gas demand grows by 14 per cent by 2040 compared to 2016 and forms approximately a quarter of the global energy mix.**" However, according to the IEA<sup>56</sup>, this '450 Scenario' reflects policies "*that put the world on a pathway that is consistent with having around a **50% chance** of limiting the global increase in average temperature to 2°C in the long term, compared with pre-industrial levels.*" Therefore, this scenario gives the world an equal chance of exceeding 2°C as it does of stay below 2°C. To avoid the worst consequences of climate change, the goal is to stay well-below 2°C .

79. Moreover, current information from the IEA<sup>57</sup> already shows 11% growth from 2014 to 2018, before considering demand from 2019 and 2020. This matches the IEA's conclusion that natural gas production has grown at an annually compounded growth rate of 2.8%, implying a 14.8% rise from 2014 through 2019. In other words, **the world demand for gas has already outpaced that of the '450 Scenario' that yields only 50-50 odds of holding warming to 2°C. There is no room for increased gas production, precisely as is displayed in Figure 1.**

80. It is well-known that **the IEA has consistently, over two decades, underestimated in its forward projections the rapid uptake of renewables<sup>58,59</sup>**. The large magnitude by which the IEA has underestimated the growth of renewables is shown in Figure 3, below.



*Figure 3: IEA’s projections for global wind (left) and solar (right) energy installations per year (coloured lines) compared to the actual annual increase in new capacity of wind and solar additions (dashed black line). Year after year, IEA predictions for the following 25-year period are approximately flat, whereas the actual uptake has been steeply rising. **This casts serious doubt on reliance of IEA estimates for the role of gas compared to wind and solar over the life time of the Narrabri Gas Project.** Plots are taken from Liebreich, M. (2017).*

81. This continual underestimation of the role of renewables by the IEA has led to a precaution by some that **“policy-makers are advised to consider the expansion of renewables well beyond the WEO projections in their energy policies in order to avoid stranded investments in future”<sup>60</sup>**. To the extent that increased jobs in NSW are considered a benefit of proposed the Narrabri Gas Project, **the risk of these jobs being stranded, works against the application.**

82. The Santos document claims that ‘fuel switching’ to natural gas for electricity generation can reduce the emissions intensity of an electricity grid, citing experiences in the USA and the UK as examples. However, the full story is much more complex, and depends heavily on renewables.

83. **The latest information<sup>61</sup> from the US Energy Information Administration (EIA) shows that the US energy grid has decreased its emissions from non-carbon sources by nearly as much as by gas (see Figure 4a). Furthermore, despite the shale boom, non-carbon energy sources have now overtaken any other single source of fossil fuel in supplying energy to the US grid (see Figure 4b).**

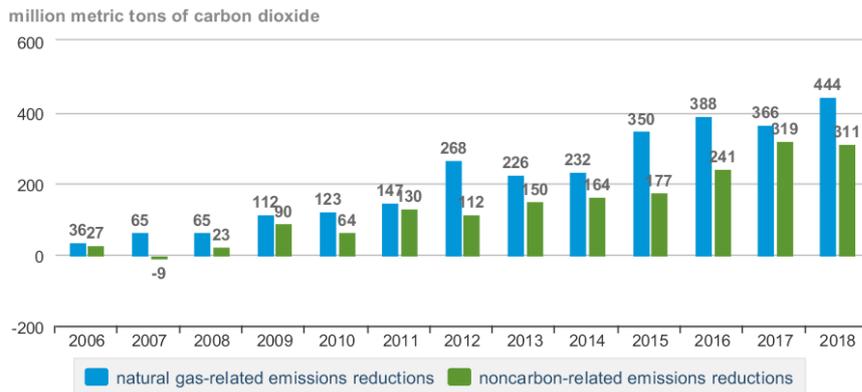


Figure 4a: Estimated tons of carbon dioxide saved by fuel switching to natural gas (blue bars) and non-fossil fuels (green bars) over time in the USA from 2006 to 2018. Plots in Fig. 4a and 4b taken directly from the latest IEA Report.<sup>62</sup>

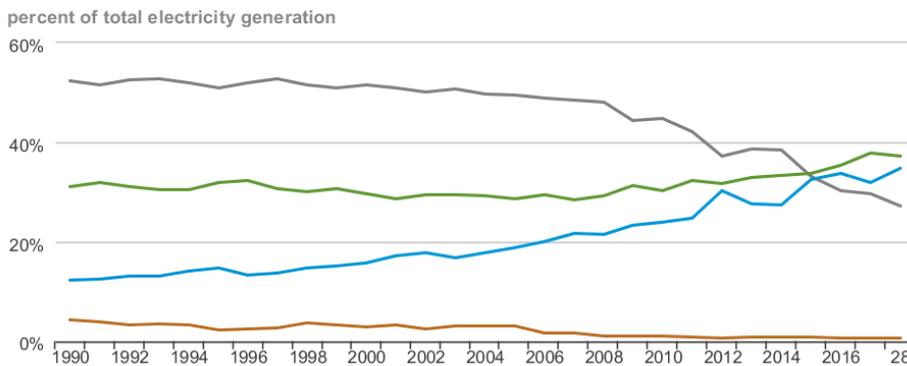


Figure 4b: Percent of total electricity generation in the US from 1990 to 2018 due to coal (grey), non-carbon (green), natural gas (blue), and petroleum (brown). **Non-fossil fuel electricity generation in the US now has a higher share than any individual fossil fuel, including gas.**

84. Similarly, in the UK, renewables have played a large role in reducing emissions in the electricity grid. In the decade 2006 to 2016, the renewables share (excluding large hydro) of UK electricity production rose from 2% to 25%<sup>63</sup>.
85. The Santos submission states that “the ‘gas-led’ reduction in emissions has allowed the United Kingdom to have one of the fastest declines in domestic emissions of the past 30 years” referencing Hausfather<sup>64</sup> (2019). But Hausfather’s analysis points to a large shift to renewables in recent years. Whilst the 1990s ‘dash for gas’ was responsible for the largest cumulative amount of avoided emissions between 1990 and today, the situation is different now. **In 2017, the transition to renewable energy was the largest driver in UK electricity sector reductions, at 37%**, says Hausfather. In second place, on 33% of avoided emissions is lower electricity demand, while **coal to gas switching came in third at 29% of the current reductions.**<sup>65</sup>
86. The conclusion is that over the past thirty years, gas has played a role in reducing emissions through ‘fuel switching’ from coal. However, **as the examples from the US and UK illustrate, reductions in electric grid emissions are now coming predominately from renewables replacing coal. ‘Fuel switching’ from coal to gas is policy based on factors that were at play around the turn of the century, not in the world of 2015 and beyond.**

## Opinion of Richard Lancaster SC (Appendix B, 7 August 2020)

87. Attached as Appendix B to the Santos additional material document<sup>66</sup> entitled 'Narrabri Gas Project (SSD 6456), Submission to IPC following public hearing' is an opinion written by Richard Lancaster SC, with regard to, *inter alia*, matters associated the Principle of Inter-generational Equity in relation to climate change and social and economic impacts. Here, I briefly respond to two matters in his submission.
88. First, Mr Lancaster SC, at his paragraph 66, states three principles underpinning intergenerational equity, referring to the matter of *Gray v Minister for Planning*. I am not able to assess the legal veracity or precedent set by that case, but in this response take these underlying principles at face value, namely:
- (i) *the conservation of options principle which requires each generation to conserve the natural and cultural diversity in order to ensure that development options are available to future generations;*
  - (ii) *the conservation of quality principle that each generation must maintain the quality of the earth so that it is passed on in no worse condition than it was received;*
  - (iii) *the conservation of access principle which is that each generation should have a reasonable and equitable right of access to the natural and cultural resources of the earth.*
89. Mr Lancaster SC is of the view that some submissions opposing the Narrabri Gas Project did not adequately address the third of these principles, the conservation of access principle, stating without further explanation that, in his opinion, this limb pulls in the opposite direction (which is to say in favour of the Narrabri Gas Project) of the other two. **In my scientific view, given the current state of the climate, and possible trajectories for the climate in future, the Narrabri Gas Project also fails on the conservation of access principle.**
90. Specifically, the current generations have and have had unparalleled access to fossil fuels, including those extracted from NSW. Future generations will have to weigh their access against the growing risks of global warming associated with fossil fuel use. **The coal seam gas that would be extracted by the Narrabri Gas Project must stay in the ground in order for younger generations and those of the future, to have anything approaching reasonable or equitable access, awaiting such a time that extraction of those resources can be done in a manner that does not endanger them or the natural resources on which they will depend in any way.**
91. Second, in explicitly addressing my previous submission<sup>67</sup> to the IPC on the Narrabri Gas Project, Mr Lancaster SC expresses the opinion that if a consent authority were to conclude

that “*based on the carbon budget approach as described by Professor Sackett, no new fossil fuel developments could be approved under any circumstances*” that he would consider it not complying with statutory framework by which the development application must be determined. I am not well-versed in the law, and so cannot make such a determination. However, it is incorrect to ascribe to me the view that “based on the carbon budget approach, no new fossil fuel developments can be approved *under any circumstances*.” **Rather, I have assessed the current state of climate science against the Narrabri Gas Project specifically, providing lines of evidence from a variety of approaches, studies, and detailed research. I have concluded that the best available science, including proper application of the carbon budget, countenances against approval of development consent for the Narrabri Gas Project.**

92. On the matter of the carbon budget and its specific use in the Narrabri Gas Project matter, I refer to the subsection with that name in Section III.
93. More generally, in the Executive Summary of my earlier submission, I stated that my view in relation to the Narrabri Gas Project, based on scientific evidence which I presented, is that “the Narrabri Gas Project must not proceed on grounds of environmental and climate considerations, responsible stewardship, and social equity for and safety of future generations.” Further detail in this regard is given in Section III of this submission, in which I address particular matters related to Ecologically Sustainable Development and apply them to the Narrabri Gas Project. This is underpinned by the best available science presented that *increased (new) gas production at the current time:*
- a. is not needed;
  - b. produces emissions that do not coincide with pathways holding global warming well-below 2°C, and thereby would introduce serious risks to humans and the environment;
  - c. is no longer an appropriate switching fuel from coal; and
  - d. that the Narrabri Gas Project in particular will make the stated Australian and NSW greenhouse gas emissions goals substantially harder to meet.
94. **I ask that the IPC, in making its determination, review my submissions to have a clear understanding of the scientific points I have raised and the final conclusion to which they have led me.**

Respectfully submitted on 21 August 2020,



## References

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- <sup>1</sup> Protection of the Environment Administration Act 1991, No. 60, NSW Government, Part 3, Section 6, accessed here: <https://www.legislation.nsw.gov.au/#/view/act/1991/60/part3/sec6>
- <sup>2</sup> New South Wales Department of Planning, Industry and Environment (NSW DPIE) 14 August 2020, Narrabri Gas Project (SSD 6456), Response to Independent Planning Commission Questions, accessed at: <https://www.ipcn.nsw.gov.au/resources/pac/media/files/pac/projects/2020/03/narrabri-gas-project/correspondence/department/200814-in-dpie-responses-to-ipc-questions.pdf>
- <sup>3</sup> National Strategy for Ecologically Sustainable Development, Australian Government, endorsed by COAG in 1992, accessed at: <http://www.environment.gov.au/about-us/esd/publications/national-esd-strategy-part1>, ISBN 0 644 27253 8
- <sup>4</sup> National Strategy for Ecologically Sustainable Development, Australian Government, endorsed by COAG in 1992, accessed at: <http://www.environment.gov.au/about-us/esd/publications/national-esd-strategy-part1>, ISBN 0 644 27253 8
- <sup>5</sup> Protection of the Environment Administration Act 1991, No. 60, NSW Government, Part 3, Section 6, accessed here: <https://www.legislation.nsw.gov.au/#/view/act/1991/60/part3/sec6>
- <sup>6</sup> Protection of the Environment Administration Act 1991, No. 60, NSW Government, Part 3, Section 6, accessed here: <https://www.legislation.nsw.gov.au/#/view/act/1991/60/part3/sec6>
- <sup>7</sup> Sackett, P. D. (2020) Expert Report on the Greenhouse Gas and Climate Implications of the Narrabri Gas Project (SSD-6456), submitted to the NSW Independent Planning Commission on 9 August 2020, accessed at: <https://www.ipcn.nsw.gov.au/projects/2020/03/narrabri-gas-project>
- <sup>8</sup> SEI, IISD, ODI, Climate Analytics, CICERO, and UNEP. (2019). *The Production Gap: The discrepancy between countries' planned fossil fuel production and global production levels consistent with limiting warming to 1.5°C or 2°C*. <http://productiongap.org/>
- <sup>9</sup> SEI, IISD, ODI, Climate Analytics, CICERO, and UNEP. (2019). *The Production Gap: The discrepancy between countries' planned fossil fuel production and global production levels consistent with limiting warming to 1.5°C or 2°C*. <http://productiongap.org/>
- <sup>10</sup> SEI, IISD, ODI, Climate Analytics, CICERO, and UNEP. (2019). *The Production Gap: The discrepancy between countries' planned fossil fuel production and global production levels consistent with limiting warming to 1.5°C or 2°C*. <http://productiongap.org/>
- <sup>11</sup> McGlade C and Ekins P (2015) The geographical distribution of fossil fuels unused when limiting global warming to 2°C. *Nature* 517: 187-190.
- <sup>12</sup> SEI, IISD, ODI, Climate Analytics, CICERO, and UNEP. (2019). *The Production Gap: The discrepancy between countries' planned fossil fuel production and global production levels consistent with limiting warming to 1.5°C or 2°C*. <http://productiongap.org/>
- <sup>13</sup> Protection of the Environment Administration Act 1991, No. 60, NSW Government, Part 3, Section 6, accessed here: <https://www.legislation.nsw.gov.au/#/view/act/1991/60/part3/sec6>

- <sup>14</sup> WMO 2019, United in Science, Report prepared for the UN Climate Action Summit 2019, <https://wedocs.unep.org/bitstream/handle/20.500.11822/30023/climsci.pdf>
- <sup>15</sup> NB: “RCP” is Representative Concentration Pathway, which is a scenario for the concentration of greenhouse gases in the atmosphere. The numbers refer to the ‘radiative forcing’ for a scenario, in Watts per square metre.
- <sup>16</sup> Collins, M. et al. (2013) Long-term climate change: Projections, commitments and irreversibility, in *Climate Change 2013: The Physical Science Basis, Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, edited by Stocker et al. Cambridge University Press, pp. 1029-1136.
- <sup>17</sup> Le Quéré, C et al. (2018) Global Carbon Budget 2018, *Earth Syst. Sci. Data*, 10, 2141–2194, <https://doi.org/10.5194/essd-10-2141-2018>
- <sup>18</sup> Climate Action Tracker (2019), <https://climateactiontracker.org/countries>
- <sup>19</sup> Climate Action Tracker (2019), <https://climateactiontracker.org/countries/australia/>
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