

Introduction

I am making this submission as a concerned citizen with an educational and work history which qualifies me to comment on technical and economic matters such as those in the subject project. A graduate in Chemical Engineering and Commerce, I have worked for Exxon in the petrochemicals industry, for the Australian Trade Commissioner Service in Europe and the Middle East, for Australia's engineering and project management contractors for twenty years and for an ASX-listed oil and gas developer where I managed engineering development and other studies which lead to EPBC-approved projects for chemicals and LNG offshore the NT. A total of over 40 years' experience in major project engineering, operations and new concept developments and management.

Introduction - the Barossa gas to Darwin LNG project

This referral clarifies some points of uncertainty about what Santos is intending to do with the Barossa gas to Darwin LNG project.

Santos is planning a carbon capture and storage (CCS) scheme with the Barossa gas development to reduce the very high emissions from the project arising from the exceptionally high CO₂ content of Barossa gas.

Emissions from the project with CCS and without - not much difference

Based on the NOPSEMA-approved Offshore Project Proposal by ConocoPhillips of March 2018, and adding the emissions at Darwin LNG plant produces total emissions of 5.4million tonnes of CO₂ per year to produce 3.7Mt/year of LNG. That represents an emissions intensity of 1.47 tCO₂/tLNG - twice the Australian LNG industry average, based on EIS data.

Now it seems that the Barossa to Darwin LNG project, even with a CCS element, would still produce more carbon dioxide emissions offshore and onshore than it will produce LNG.

I base this on the research I have done recently on data contained in project EISs, OPPs and similar documents that has led me to write several papers which have been published and quoted in the media.

The table (refer Attachment 3) shows the basis of the above statements, based on the Barossa OPP and Darwin LNG information (Case A) and as deduced for the case with CCS added (Case B). The emissions figures are not calculated in detail but directionally correct.

I have done this work in the public interest because I am concerned that emissions from the Australian LNG industry have grown disproportionately higher than the growth in LNG capacity. as inferior quality gas reserves have ben developed. Barossa is a leading example of this alarming trend.

A schematic or block flow diagram of the total development is shown in the following Figure 1.

Refer Attachment 2

Conclusion

Adding CCS to the Barossa development in the way Santos appears to favour would bring little or no reduction in emissions, while adding substantial cost, delays and risk.

For final approval, this project should be required by the relevant authorities to build the CCS-enabling facilities no later than the gas production facilities and to prove their satisfactory operation before any export of LNG cargoes are permitted.

From ES:

Introduction - myself

I am making this submission as a concerned citizen with an educational and work history which I believe qualifies me to comment on technical and economic matters such as those involved in the subject project.

I am a graduate in Chemical Engineering and Commerce and have worked for Exxon in the petrochemicals industry, for the Australian Trade Commissioner Service in Europe and the Middle East, for Australia's then leading engineering and project management contractors for twenty years and then for a small ASX-listed oil and gas developer where I managed engineering development and other studies which lead to EPBC-approved projects for chemicals and LNG projects offshore the NT. A total of over 40 years' experience in major project engineering, operations and new concept developments and management.

Introduction – the Barossa gas to Darwin LNG project

It has been hard to get a fix on exactly what Santos is intending to do with the complete Barossa gas to Darwin LNG project, the offshore parts of which are already NOPSEMA-approved and under construction (the Floating Production Storage and Offloading (FPSO) vessel in South Korea).

But now the above-referenced referral about the additional pipeline through Darwin Harbour clarifies some, but not all points of uncertainty about the project.

In the referral Santos has now explained that it is planning this pipeline to enable a carbon capture and storage (CCS) scheme associated with the Barossa gas development - apparently in an attempt to reduce the very high emissions from the project arising from the exceptionally high CO₂ content of Barossa gas.

Emissions from the project with CCS and without – not much difference

Based on the NOPSEMA-approved Offshore Project Proposal by ConocoPhillips of March 2018, and adding the combustion and venting CO₂ emissions from the FPSO at Barossa to the emissions at Darwin LNG plant would produce total emissions of 5.4million tonnes of CO₂ per year to produce 3.7Mt/year of LNG. That represents an emissions intensity of 1.47 tCO₂/tLNG – twice the average of Australian LNG currently operating, based on EIS data.

Now, perhaps surprisingly to some, it seems that the Barossa to Darwin LNG project, even with the addition of a CCS element, would still produce more carbon dioxide emissions offshore and onshore than it will produce LNG.

I base this on the work I have done in recent years in researching data contained in project EISs, OPPs and similar documents that has led me to write several papers which have been published by the Institute for Energy Economics and Financial Analysis and widely quoted in the media.

The table below shows the basis of the above statements, based on the Barossa OPP and Darwin LNG information (Case A) and as deduced by me for the same case but with CCS added as Santos has described in their referral (Case B). The emissions figures are not calculated in detail but directionally correct.

MtCO2/y	Barossa FPSO		Darwin LNG and B-U		Total Emissions	Emissions Intensity
	Vent	Comb	Vent	Comb		
Scenario					MtCO2/y	tCO2/tLNG
A: OPP basis	1.8	1.6	0.5	1.5	5.4	1.47
B: OPP+SantosCCS	0	1.9*	0	3.5*	5.4	1.47

*Assumptions made:

- 1/3 of Case A combustion emissions is from powering AGRU, and the balance is from powering the LNG process
- Case B will therefore require 2 new AGRUs at DLNG, so add 1.0 to 1.5 of Scenario A
- Case B FPSO separation duty gone but extra compression to move 18%CO2 gas to Darwin
- Case B will require CO2 compression into pipeline, adding 0.5
- Case B will require CO2 re-compression at B-U, adding 0.5. Note: source of gas for power at B-U facilities is unknown since B-U reserves depleted by this time
- Note that all combustion for power, etc at DLNG would use 18%CO2 fuel gas instead of 6%, so the flue gas would be richer in CO2 and likewise emissions per unit of power produced in gas turbines.

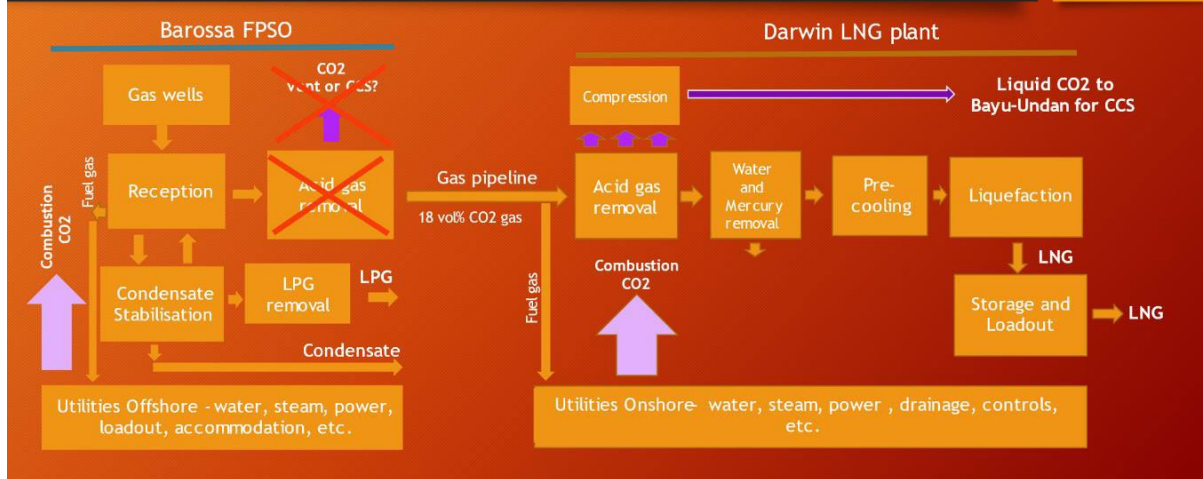
I have done this work, in retirement and in the public interest because emissions from the Australian LNG industry have grown disproportionately higher than the growth in LNG capacity as inferior quality gas reserves have been developed. Barossa is a leading example of this alarming trend in light of the Paris Agreement, the IEA statement and COP26 resolutions to aim for net zero carbon emissions mid this century to preserve life on the planet.

A schematic or block flow diagram of the total development is shown in the following Figure 1.

Figure 1 – The Barossa to Darwin LNG development – a simplified flowscheme

Emissions from the Modified Barossa gas to Darwin LNG project

- Deduced from Santos statements- Scenario D?



Conclusion

Adding CCS to the Barossa development in the way Santos appears to favour would bring little or no reduction in emissions, while adding substantial cost, delays and risk.

If it is still to be considered for approval, this project should be required - by the relevant authorities - to build the CCS-enabling facilities no later than the gas production facilities and to prove their satisfactory operation before any export of LNG cargoes are permitted. A repeat of the Gorgon CCS debacle in Western Australia is just not acceptable.

Approval for the commencement of work on the Barossa gas development and DLNG modifications should be suspended until a complete review of this apparently now fundamentally changed project is given approval.