LNG DEMAND: DO WE HAVE ENOUGH GAS?
OUR GAS PRICES? OUR GAS FUTURE? SOMEBODY HELP!

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Introduction

Historically, the Eastern Australian gas market has been relatively insulated from international market pressures, operating on a somewhat "self-sufficient" business model. However, the recent large scale development of export LNG facilities is about to change all of that as the eastern Australian gas market has found itself in the midst of the largest structural revolution since the privatization of gas infrastructure assets in the 1990s. Predictably, participants in the Eastern gas market are keen to understand the effects this impending LNG play will have not only on their market positions, but also on the whole production – demand supply chain on the domestic front.

Exactly how the market will respond to these changes is not yet clear, however, some important questions on the mind of every market participant are: "do we have enough gas to meet short, medium to long term domestic demand? At what prices? How quickly are these prices going to move up the price curve towards a LNG netback price if at all there is a chance of netback pricing? Are there means to help obviate a shortage and extreme pricing?" In answering these questions and given the opaque nature of the gas market, there exists an asymmetry of opinions.

For the first time, the role of storage and linepack optionality on potential shortages and high prices as a result of LNG demand are presented for 2014-2023.

Summary

- For the first time, the effect of storages and linepack on gas pricing whilst accommodating for LNG exports are investigated.
- The modelling indicates that storages and linepack can potentially take on roles, such as flattening the gas price curve in the long term, other than their traditional peak-shaving facilities when their option is duly optimised.
- The results presented are consistent with the general consensus that the risk of extreme gas shortage is low. New supply sources would improve system welfare and drive gas prices further down the price curve, and there is enough evidence to suggest that the impending LNG exports can be accommodated by the market.
- Further, another avenue to improve welfare and reduce shortage risk involves expanding the transmission system by building new pipelines (such as linking the Northern Territory to the eastern market), and a further study can be carried out to explore this possibility.
- Other further studies include running a gas-electricity co-optimisation model, and examining how increased prices at gas nodes in QLD affects generator dispatch in the National Electricity Market (NEM).

Icon	Class	Description
	Gas Basin	Basins from which gas is produced
	Gas Field	Field from which gas is extracted
	Gas Storage	Storage where gas is injected/extracted
	Gas Pipeline	Pipeline for transporting gas
	Gas Node	Connection point in gas network
	Gas Demand	Demand for gas covering nodes

Figure 1 PLEXOS® model inputs used for this study

Method

Scheduling of gas energy markets require highly specialized tools to conquer the complexity of this dynamic, commercial and regulatory landscape. PLEXOS® integrated gas and electricity simulation software package provides technical and mathematical solutions to meet planning needs. Given its use of cutting-edge mathematical programming, stochastic optimization, and the latest data handling techniques, PLEXOS® Integrated Energy Model was chosen for this study.

Assumptions

- Contracts between market participants are excluded as this information is not readily available. This study aims at maximizing market welfare by taking a least-cost modelling approach, assuming a perfectly competitive market and by default, does not take into account the market power of participants.
- Pipeline outage and maintenance can be modelled in PLEXOS®, however, they are not included in this study.
- A fixed LNG netback price of $12.8/GJ is assumed. In the light of the recent fall in oil prices (and delayed flow on to LNG prices), we comment that the assumed LNG netback price employed in this model is only but a parameter, assumed to demonstrate the domestic market interaction with international LNG prices.
- This study only considers 2P reserves already in operation and new CSG developments in New South Wales are excluded.

Scenarios

- Base Scenario: No LNG demand in Queensland, and an outlook of the market is carried out over the next 10 years with LNG demand remaining offline.
- LNG Base Run: We turn on LNG Demand with no storages (storage facility or linepack) and examine the effects this demand will have on gas prices, supply and demand in the major nodes. In this scenario, extremely high prices (and possible netback pricing) is only possible when supply is tightly constrained.
- LNG Base Run + Storages: Same as above with storages and linepack turned on.
- LNG Netback Run: The potential for shortages and LNG netback pricing is examined here by setting the production cost from mid-2015 for the Bowen Surat basin to the LNG netback price and we study how this high production cost filters through the market.
- LNG Netback Run + Storages: Same as above with storages and linepack turned on.

Discussion and results

LNG Base Run
- System price ranging from about $4 - $8 with gas prices at the major nodes away from Queensland (Sydney, Melbourne, Adelaide) likely to hover around the $4 - $6 mark.
- Shortage potential of up to 7PJ in 2023, mostly from LI users and GPG.

LNG Base Run + Storages
- Overall system price range is reduced to $4 - $6
- No shortages
- Capturing storage options efficiently can maximize market welfare in the long run by flattening the gas price curve.

LNG Netback Run
- LNG demand and netback pricing in Queensland puts New South Wales at a probable risk of small shortages from 2015, and up to 37 PJ by 2023.
- Gas price in New South Wales expected to rise as high as $9.70/GJ in 2023

LNG Netback Run + Storages
- Shortages in New South Wales are cut to 12 PJ by 2023, and the LI demand curtailment is also not seen till 2020.
- Gas price reduced to $ 8.71/GJ in 2023
- The ability to optimally capture storage options can be quite crucial in maximising market welfare; not only to reduce the potential for shortages, but also to protect the domestic market from high prices in the long run.

Figure 2 Gas network modelled in PLEXOS®, the main demand zones included in this study are: Mount Isa, Gladstone, Roma, Brisbane, Adelaide, Sydney, Melbourne and Hobart

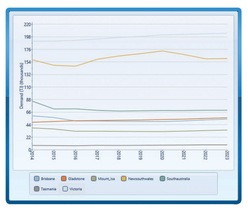

Figure 3 Demand profiles (excluding LNG demand) for the major regions examined in this study

Gas Node	Year	Average Gas Price ($/GJ) LNG Netback Run	Average Gas Price ($/GJ) LNG Netback Run + Storages	Average Gas Price ($/GJ) LNG Base Run	Average Gas Price ($/GJ) LNG Base Run + Storages
Adelaide	2014	5.55	5.87	5.55	5.53
Adelaide	2015	5.62	6.18	5.52	5.57
Adelaide	2016	5.57	6.19	5.52	5.60
Adelaide	2017	5.68	6.21	5.52	5.59
Adelaide	2018	5.72	6.19	5.52	5.63
Adelaide	2019	5.98	6.23	5.52	5.64
Adelaide	2020	7.55	6.56	5.52	5.64
Adelaide	2021	7.40	5.99	5.52	5.55
Adelaide	2022	7.44	6.52	5.52	5.54
Adelaide	2023	8.89	7.53	5.55	5.73
Melbourne	2014	5.03	5.23	5.03	5.03
Melbourne	2015	5.03	5.21	5.03	5.10
Melbourne	2016	5.03	5.30	5.03	5.15
Melbourne	2017	5.03	5.20	5.03	5.18
Melbourne	2018	5.03	5.17	5.03	5.24
Melbourne	2019	5.03	5.03	5.03	5.23
Melbourne	2020	5.03	5.03	5.03	5.24
Melbourne	2021	5.03	5.03	5.03	5.25
Melbourne	2022	5.25	5.08	5.03	5.22
Melbourne	2023	7.75	6.03	5.03	5.03
Sydney	2014	5.72	5.89	5.72	5.68
Sydney	2015	6.04	6.32	5.67	5.57
Sydney	2016	6.01	6.37	5.66	5.57
Sydney	2017	6.27	6.52	5.73	5.62
Sydney	2018	6.40	6.58	5.73	5.60
Sydney	2019	7.22	7.75	5.75	5.60
Sydney	2020	9.60	8.15	5.77	5.62
Sydney	2021	9.39	7.47	5.74	5.52
Sydney	2022	9.26	7.71	5.70	5.47
Sydney	2023	9.70	8.71	6.23	5.87

Figure 4 Gas price output for scenarios considered in this study (QLD nodes exempted)

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