

# Analysing the Demand – Supply Dynamics of the Australian South Eastern Gas Market Using PLEXOS®



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## Executive Summary

These are interesting times for the Eastern Australian gas market with the impending LNG play coming online. The previously stable and long-term contract market for domestic gas supply on the east coast will be subject to market forces that are in part determined on the global stage. Exactly how the market will respond to these changes is not yet clear, however, one important question on the mind of every market participant is: “do we have enough gas to meet medium to long term domestic demand?” In answering this question and given the opaque nature of the gas market, there exists an asymmetry of opinions in the demand – supply market analysis.

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 privatisation 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. In order to predict any effect the LNG development will have on the domestic market, a comprehensive understanding of the domestic supply chain is necessary.

This paper aims to analyse the demand - supply interactions of the eastern Australian gas market, in order to establish any potential risk of gas shortage in the medium to long term. Employing a model developed through the new gas module from PLEXOS®, an analysis of the market is carried out from 2013 - 2024. An examination of this nature is fundamental to understanding not only the LNG effects on the market, but also to identify any potential supply shortfalls looming in the near future.

## Model Description

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. Using cutting-edge mathematical programming, stochastic optimisation, and the latest data handling techniques, PLEXOS® Integrated Energy Model provides a robust analytical framework for power market modellers. PLEXOS® meets the demand of gas market participants, planners, investors, regulators and analysts with a comprehensive range of features delivered through an easy-to-use interface and powerful simulation engine.

The gas module in PLEXOS® allows detailed modelling of the physical delivery of gas from producing fields, through pipelines and storages (including linepack), to demand points with the capability to model any physical constraint along the supply chain. Further, the PLEXOS® Integrated Energy Model has the ability to optimize gas and electricity markets by simultaneously solving both markets' parameters, allowing decision makers to trade-off gas investments, constraints and costs against other alternatives. The following elements are the main components of the gas network modelled in the present study:

### Model Inputs

Icon	Class	Description
	Gas Field	field from which gas is extracted
	Gas Storage	storage where gas can be injected and extracted
	Gas Pipeline	pipeline for transporting gas
	Gas Node	connection point in gas network
	Gas Demand	Demand for gas covering one or more nodes

The model developed for this report is built with information available in the National Gas Market Bulletin and the Australia Energy Market Operator (AEMO). The demand profiles for 2013 used for the demand zones illustrated in Fig. 1 are obtained from the National Gas Market Bulletin.

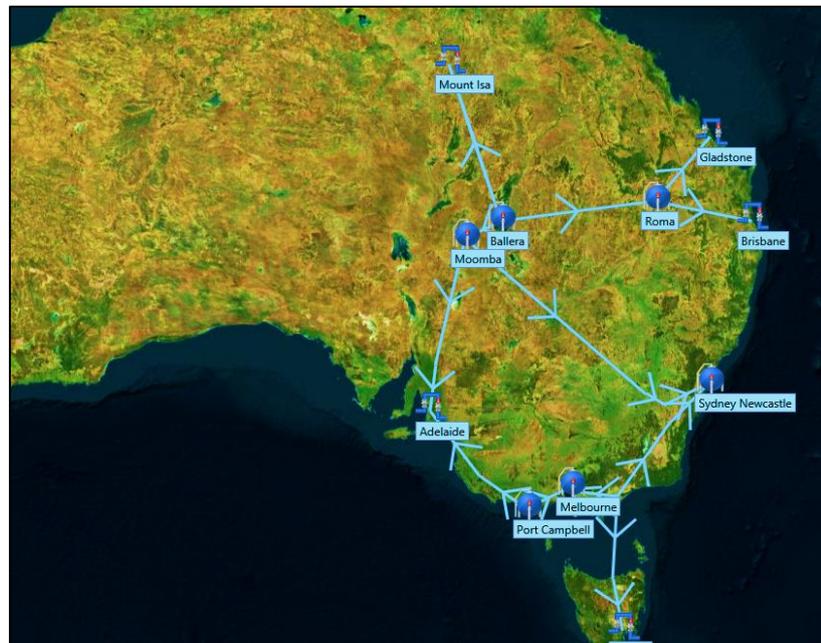


Fig. 1 Gas network modelled in PLEXOS®, the main demand zones included in this study are: Mount Isa, Gladstone, Brisbane, Adelaide, Sydney, Melbourne and Hobart

Using the projections supplied by AEMO in the Gas Statement of Opportunities (GSOO) 2013, a demand forecast is built (see Fig. 2) showing projections until 2024 for the major demand centres.

To accommodate the impact on gas production from the LNG export demand, we run a sensitivity study on the eastern Australian gas market with the production from the Bowen Surat gas fields (largest known and proven CSG basin) turned off and completely unavailable for domestic market. This assumption implies that all the production from this reserve is for export only therefore left out of this study (domestic demand-supply model). In addition, pipeline outage and maintenances are not included, and all pipelines are assumed to be online for the next 12 years. We also assume that the NSW CSG developments go ahead and are all available from the start of the planning horizon.

## Results and discussions

Firstly, we run a “base” model of the eastern Australian gas market for 12 years with all the producing fields available for production. As expected, we see no gas shortages in the system with some CSG gas fields not even required to come online in this time.



Fig. 2. Demand outlook from 2013 - 2024 as projected by the GSOO 2013

As a sensitivity to model the LNG effects on the demand – supply dynamics on the eastern domestic market, we turn off and completely make production from the Bowen Surat gas fields (the largest proven producing CSG reserves in eastern Australia) unavailable for domestic demand. A justification for this sensitivity is the assumption that all the gas produced from this basin for the next 12 years are fully contracted to LNG export. From the results, we observe that there is enough gas in the eastern reserves to accommodate the impending LNG play as there are no shortages in any of the demand zones considered in this study. In addition, we observe that CSG fields which were offline in the “base” model came online producing at almost full capacity to offset the ‘no production’ scenario from the Bowen Surat gas fields.

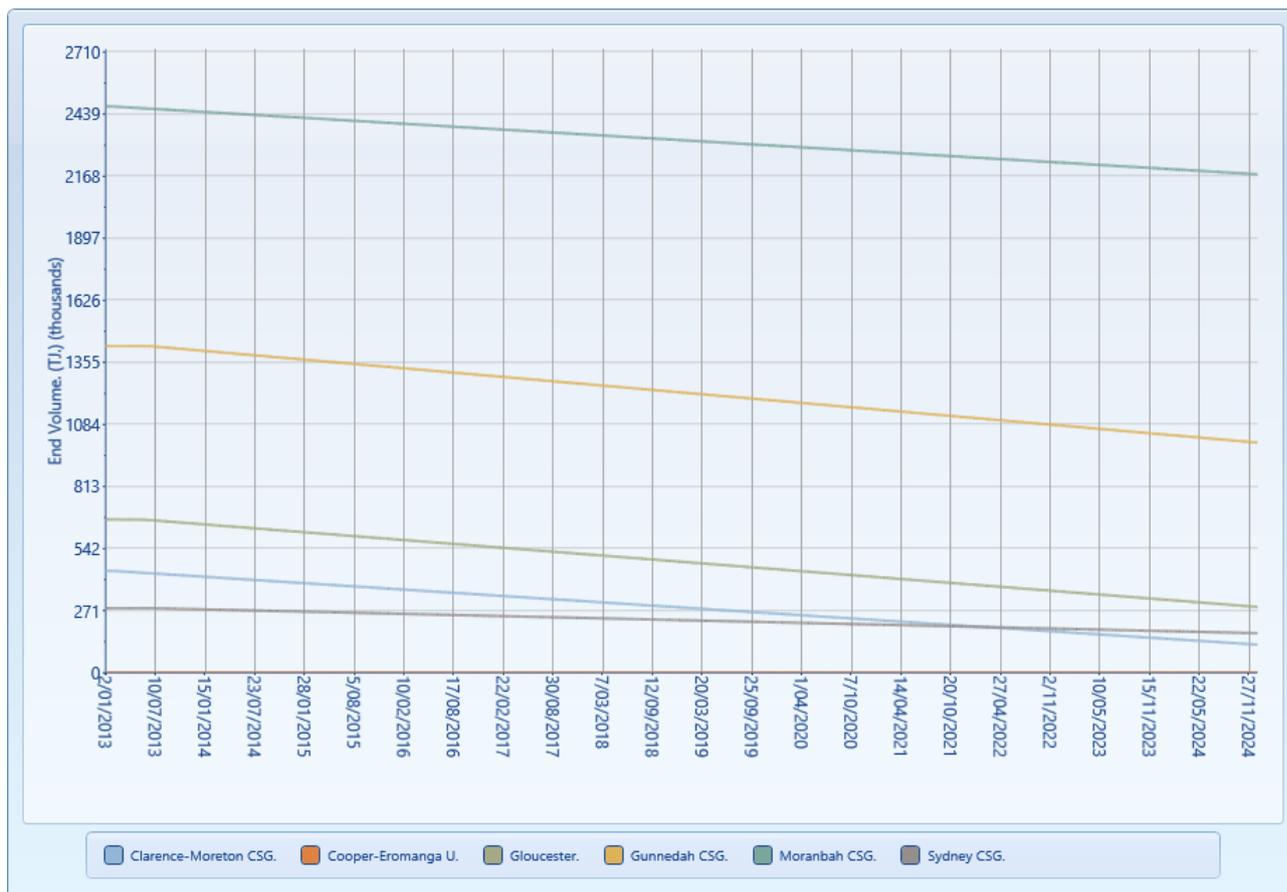


Fig. 3. Gas production with Bowen-Surat reserve completely contracted to LNG export from 2013 - 2024

This result is consistent with other studies in the literature, reaffirming the notion that eastern Australia has enough gas in its reserves to accommodate LNG exports at the current production rates and demand outlook for the next decade.

### Final comments

Given the level of uncertainty surrounding the east coast gas market, there is a need for a sophisticated and complex analysis of the different scenarios and sensitivities surrounding the current market. As such, some open questions arising from this study, all of which can be addressed with some further modelling employing PLEXOS®, are:

- Will increasing LNG exports create a domestic shortage and to what extent will this be seen in the short term?
- How does the gas landscape change with the introduction of a new carbon scheme in future years?
- How will the domestic gas market react to a netback of gas price to international LNG prices?
- Will a shift in the domestic demand outlook over the next decade impact the supply - demand dynamics of the market?

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