Examining the future of nature gas usage in the Australian National Electricity Market.

by

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• A natural tension has arisen in the Australian natural gas market between electricity generators and export markets.
• With export markets being made available to natural gas producers, the price of methane will rise to meet the international market position.
• Rapid price inflation could place gas generation assets at a distinct disadvantage against coal fired electricity production.
Ramp Gas

• Before LNG export can begin, wells will have to be installed to gauge the proven reserves for each site.

• This process will provide a significant amount of excess supply of natural gas for the electricity market before exports begin.

• The expected price of Coal Seam Methane for electricity generators is expected to drop from $3.5/GJ to $1.8/GJ
<table>
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<th>Pipeline</th>
<th>No.</th>
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<tr>
<td>Moomba to Sydney pipeline system (except for Moomba to Marsden)</td>
<td>1</td>
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<tr>
<td>Central West and Central Ranges pipelines</td>
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<td>Victorian transmission system</td>
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<td>Dawson Valley pipeline</td>
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<td>Queensland Gas pipeline (Wallumbilla to Gladstone/Rockhampton)</td>
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<td>Roma to Brisbane pipeline</td>
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<td>Carpentaria pipeline (Ballerat to Mt Isa)</td>
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<td>Moomba to Adelaide pipeline system</td>
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<td>Amadeus Basin to Darwin pipeline</td>
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<td>Goldfields Gas pipeline</td>
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<td>Dampier to Bunbury Natural Gas pipeline</td>
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<td>Eastern Gas pipeline (Longford to Horsley Park)</td>
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<td>Dongara to Perth/Gear Patrol (Parmelia)</td>
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<td>SEA Gas pipeline</td>
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<td>Tasmanian Gas pipeline</td>
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<td>Palm Valley to Alice Springs</td>
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<tr>
<td>Midwest pipeline</td>
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</tbody>
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Gas supply

**Queensland Gas Supply**

![Bar chart showing gas supply by company and year comparison](chart.png)

- **Origin Energy**
- **Santos**
- **BG/QGC**
- **Arrow Energy**
- **AGL Energy**
- **Others**

**Legend:**
- Blue: Current 2008
- Red: 2013 Forecast
The National Electricity Market

- Black and Brown coal-fired power stations compose **85%** of generation.
- 7000MW of installed gas generation
- The average Emissions Intensity Factor (EIF) for electricity generation is **1.12**.
Emissions Trading

– A Carbon Pollution Reduction Scheme (CPRS) for Australia

– Garnaut Review
  • Broad coverage, little or no grandfathering
  • Compensation to households

– White Paper
  • Assistance to stationary energy production for 5 years
  • 130million credits (~26mill/year) will be allocated to higher emitting generators
  • Equalized emissions intensity factor
    – Brown and less efficient black EIF reduced to 0.86 t e-CO2/MWH
Modeling Assumptions:
• Energy usage and new plant entry timing forecasts from NEMMCO’s SOO 2008.
• National Emissions Trading Scheme to be introduced in 2011.
• Emissions abatement pathways CPRS -15% and Garnaut 450ppm.
• Firms bid SRMC for off-peak and SRMC + VO&M during peak time.
• In equilibrium, capital costs are recovered during capacity constrained maximum price periods (VOLL).
• Bidding behaviour determines position in the merit order of dispatch and market prices.
Plexos Simulates

- Optimal dispatch of generators across the NEM.
- Optimal bid stack formulation for each station for Short Run and Long Run Marginal Cost (SRMC and LRMC) recovery.
- Merit order of dispatch formulated based on bid stack.
- Physical operating characteristics of each generating unit
- Portfolio optimisation and emissions profiles
- Transmission and Interconnector flows.
**Time frame for analysis**

- 2013-2018
- First wells in QLD to be in place ready for LNG exports
- Growth of supply of NG in QLD and the other mainland states of the NEM
- Pipelines joining all NEM states to create a gas grid
- First LNG plant to come online
- Installed capacity of GT plant across the NEM to grow a further 9GW of installed capacity (16GW)
• Gas generation will increase from a Capacity Factor of approx 35% to 85%

• Brown coal marginalized particularly Hazelwood in Victoria with an EIF of 1.35t/MWH
  – At $40/t e-CO₂ and ramp gas available this station should back off.

• Average spot prices: (Demand Weighted Average for all states to form a national price)
  – $52/MWh with ramp gas
  – $84/MWh following the commencement of export
Conclusions

- Modelling suggests that a significant increase in gas prices will weaken the prospect of gas fired generation as a intermediate solution to reduce emissions.
- Ramp Gas availability will for at least 3 years place significant pressure on Brown Coal generation assets in the merit order of dispatch.
Research Funded by

• Australian Research Council Linkage Grant Scheme
• Post-Doctoral Research Fellowship funded by a University of Queensland
• Special thanks also to Dr Glenn Drayton and Energy Exemplar the developers of Plexos.

– Plexos for Power Systems will be available for research and teaching purposes for free later this year.