Modelling the commercial feasibility of gas pipeline expansion and subsequent impact on wholesale energy prices

PLEXOS UGM, Valencia, June 2019

Lumi Adisa
Senior Consultant – Wholesale & Modelling
Can improved connectivity in the wholesale gas markets deliver lower energy prices for consumers?
Who we are: Cornwall Insight

Pre-eminent providers of market, regulatory, policy research, analysis, training and consulting in energy and water

Independent experts across borders and international markets (including GB & Ireland, Europe and Australia)

Trusted by customers for our unrivalled insight guiding them to success - we support clients from across investment, developers/generators, suppliers/retailers, governments and regulators

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Cornwall Insight

www.cornwall-insight.com
Our coverage policy and regulation

Policy and regulation

- Market design support
- Renewables policy design
- Renewables contract design – such as PPAs
- Reviews and options papers for new markets

Code governance

- Experienced professionals in code governance and market rules
- Code design for networks, trading, balancing, PPAs and renewables

Integration

- Renewables modelling
- Renewables developer support
- Green certification schemes and proving renewables

Energy policy and regulation

Code governance

Renewables integration
Energy market training

Delivery

Leading provider of energy training in GB and Ireland

Delivery model based on subject experts providing bespoke content

In 2018/19 we delivered over 100 courses to 1,750+ attendees including renewable workshops in Oman for GCC nations and other locations

Options for support

Our training is used by government, regulators and industry

We can provide training on a range of topics including renewables policy options, support mechanisms, energy financing, market design, energy networks, grid integration and best practice from international markets
A selection of our customers

[Various company logos]

CORNWALL INSIGHT

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Australian gas markets at a crossroads

Transformational shifts in demand... have led to price convergence

...with high prices and risk of political intervention

Sources: AEMO, Australian Energy Regulator, Reuters, Bloomberg
Ongoing development critical for supply...

Gas Supply Curve (including LNG-dedicated fields)

...as are transport links to end users

Sources: AEMO
The benefits of an interconnected market

Domestic Gas Price Range

- US Pipeline Network
  - Henry Hub
  - Domestic Gas Price Range: A$3-4/GJ

- Australian Pipeline Network
  - Existing major natural gas pipelines
  - Domestic Gas Price Range: A$9-10/GJ

Connectivity Vs spot prices?
Transmission candidates for expansion

Transmission options examined

(i) Queensland Hunter Gas Pipeline (QHGP or WNP in figure) linking the high supply source in Wallumbilla, Queensland to Newcastle, New South Wales, close to Sydney; a major load centre in the south.

(ii) Northern Gas Pipeline (NGP or NTP in figure) linking gas-rich Northern Territory to the eastern markets through Mt Isa, Queensland.

(iii) Crib Point Floating Storage Regasification Unit (FSRU) in Victoria linking the eastern gas markets to the global LNG spot market.
Configuring PLEXOS from a planning model to a commercial model

FROM A SUPPLY PLANNING MODEL (PLEXOS)...

- Reserve Productivity and Costs
- Gas Demand
- Infrastructure
- Contracts
- Technical Constraints

...TO A PRICING MODEL

- Price as an output
- Intl. Price Linkage
- LNG Netback
- LNG Contracts
- Electricity Module

- Configure the model to provide pricing outputs
- International price linkage and LNG pricing
- Reflection of LNG contract and commercial trade-offs into modelling
- Electricity module – to assess potential impacts on electricity prices
Scenarios and outputs

Scenarios:

Base Case
Base Case with build of Northern Gas Pipeline (NGP)
Base Case with build of Queensland Hunter Gas Pipeline (QHGP)
Base Case with build of Floating Regasification & Storage Unit (FRSU)
Base Case + NGP + QHGP

Results

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price $\Delta$</td>
<td>Changes in prices at key nodes relative to base case</td>
</tr>
<tr>
<td>Net System Benefits</td>
<td>NPV of $ changes in total system costs minus build costs</td>
</tr>
<tr>
<td>Investor NPV</td>
<td>NPV of investor cash flows</td>
</tr>
<tr>
<td>Electricity Market Impacts</td>
<td>Analysis of potential impacts on electricity prices</td>
</tr>
</tbody>
</table>
The results: cheaper gas is possible...

Mel, Syd and Adel nodes benefit from improved and cheaper access paths

Brisbane less affected due to proximity to CSG

The results: cheaper gas is possible...
With divergent system and investor impacts...

Net System Benefits calculated as NPV of Sum of (price differentials * volumes) at each node.
Investor benefits are calculated as NPV of EBITDA (using 8% EBITDA margin) with 10x terminal value multiple on EBITDA (3yr ave)
Calculated over 10 year horizon with discount rate of 7.5%.
Potential for cheaper wholesale electricity prices

Potential for significant reduction → Further research required to understand dynamic interactions

### Scenario 1: Lower Prices for Gas-Fired Generators

<table>
<thead>
<tr>
<th>Scenario</th>
<th>NSW</th>
<th>QLD</th>
<th>SA</th>
<th>VIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>With NGP</td>
<td>1%</td>
<td>1%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>With QHGP</td>
<td>2%</td>
<td>2%</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>With NGP + QHGP</td>
<td>4%</td>
<td>3%</td>
<td>8%</td>
<td>6%</td>
</tr>
</tbody>
</table>

### Scenario 2: Coal Generator ‘Price Taker’ Response

<table>
<thead>
<tr>
<th>Scenario</th>
<th>NSW</th>
<th>QLD</th>
<th>SA</th>
<th>VIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>With NGP</td>
<td>6%</td>
<td>7%</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td>With QHGP</td>
<td>9%</td>
<td>11%</td>
<td>7%</td>
<td>6%</td>
</tr>
<tr>
<td>With NGP + QHGP</td>
<td>18%</td>
<td>22%</td>
<td>14%</td>
<td>13%</td>
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</tbody>
</table>
Conclusion: Material benefits from interconnectivity

- Better interconnectivity and improved access could provide material price benefits for the Australian consumer.
- Sustained $2-3/GJ price reductions are achievable with increased connectivity
- NGP business case is dependant upon further reserve development – importance of removing moratoria in NT
- “Investor incumbency” effect - importance of encouraging pipeline competition
- Potential benefits to the electricity market through reduced fuel costs

Further work

- Dynamic modelling of gas-electricity interactions for the East Coast market
- Modelling of additional storage and interconnections
- Impact of uncertainty from variable renewable energy

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