Perspectives on the Eastern Australia Gas Industry to 2020

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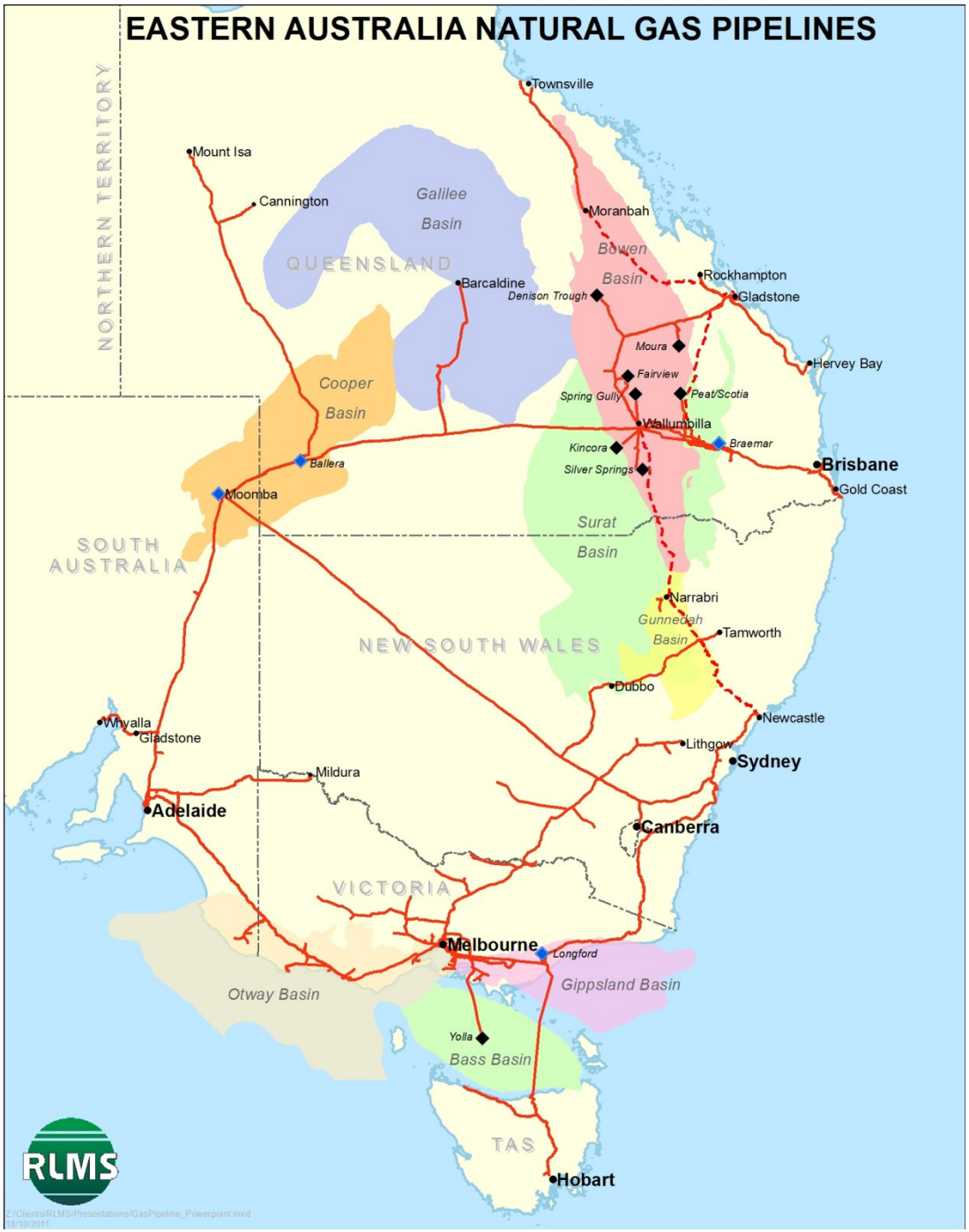
RLMS IES Intelligent Energy Systems


EASTERN AUSTRALIA NATURAL GAS PIPELINES
NORTHERN TERRITORY
QUEENSLAND
SOUTH AUSTRALIA
NEW SOUTH WALES
VICTORIA
TAS
Townsville
Mount Isa
Cannington
Galilee Basin
Moranbah
Bowen Basin
Rockhampton
Gladstone
Barcaldine
Denison Trough
Moura
Fairview
Spring Gully
Peat/Scotia
Hervey Bay
Wallumbilla
Kincora
Braemar
Silver Springs
Brisbane
Gold Coast
Cooper Basin
Ballera
Moomba
Surat Basin
Narrabri
Gunnedah Basin
Tamworth
Dubbo
Newcastle
Lithgow
Sydney
Whyalla
Gladstone
Mildura
Adelaide
Canberra
Melbourne
Longford
Gippsland Basin
Otway Basin
Yolla
Bass Basin
Hobart
RLMS
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18/10/2011

Key Features of the EAGM

Key features:

- High proportion of volumes under long term contracts
- High concentration of reserves
- Demand growth has been gradual
- Future demand growth will be rapid, highly concentrated and dominated by Queensland LNG
- Control of demand growth and reserves largely congruent
- Fewer contracts currently being negotiated than would be expected

Questions

- Will there be gas for other than LNG?
- What will be the domestic price?
- What role will gas play in electricity generation?

Contract Market

- Dominates buying/selling: over 90%
- Corollary: little liquidity and price transparency
- Many major contracts expire mid-decade and slightly later
- Initially gas displaced liquid fuels and coal
- Prices were low due to long term contracts
- Enter (not quite) PNG Gas – prices remained low
- Enter CSG - prices remained low
- Enter LNG - where will prices go?

Current Behavior of Producers

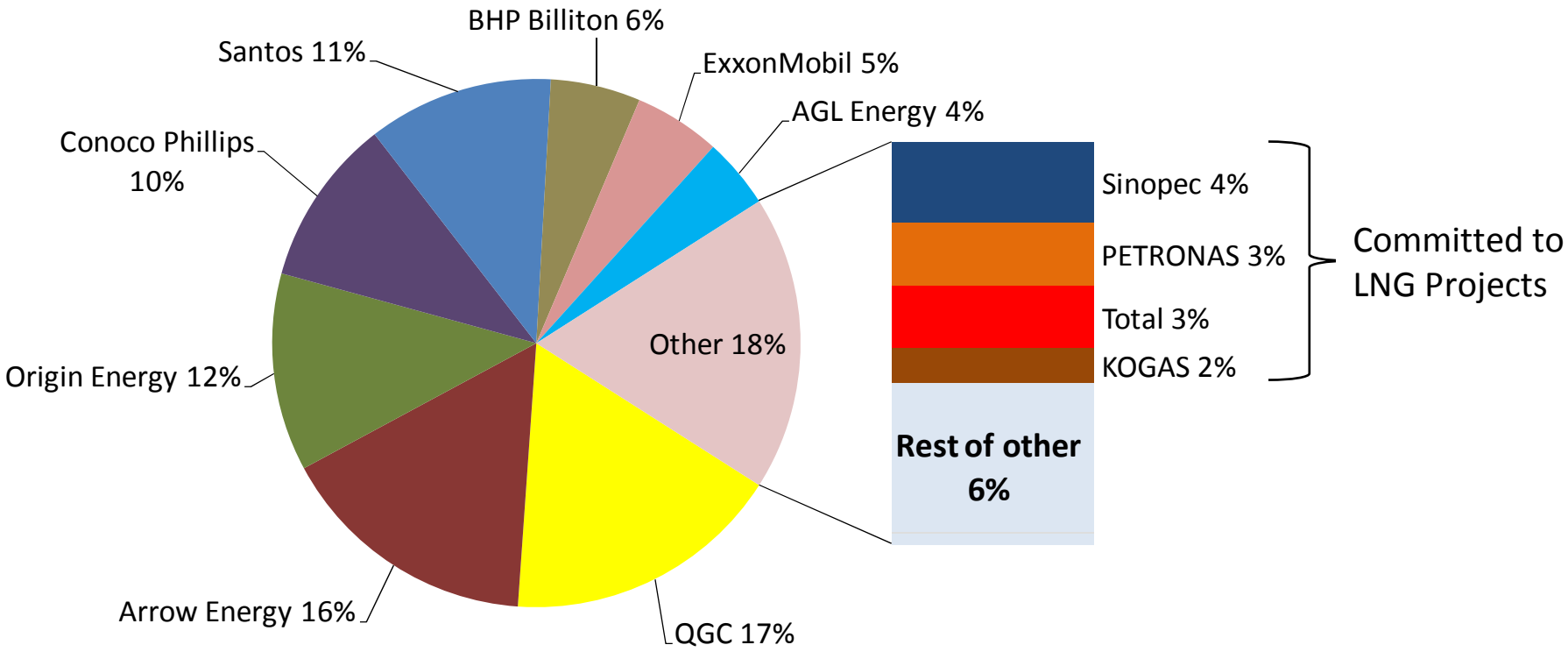
Driven by

- Prospect of linkage of domestic gas prices to those of LNG (applies to all eastern Australian reserves)
- Not yet adequate reserves for LNG projects

Outcome

- Major gas purchasers report that major suppliers are not engaging

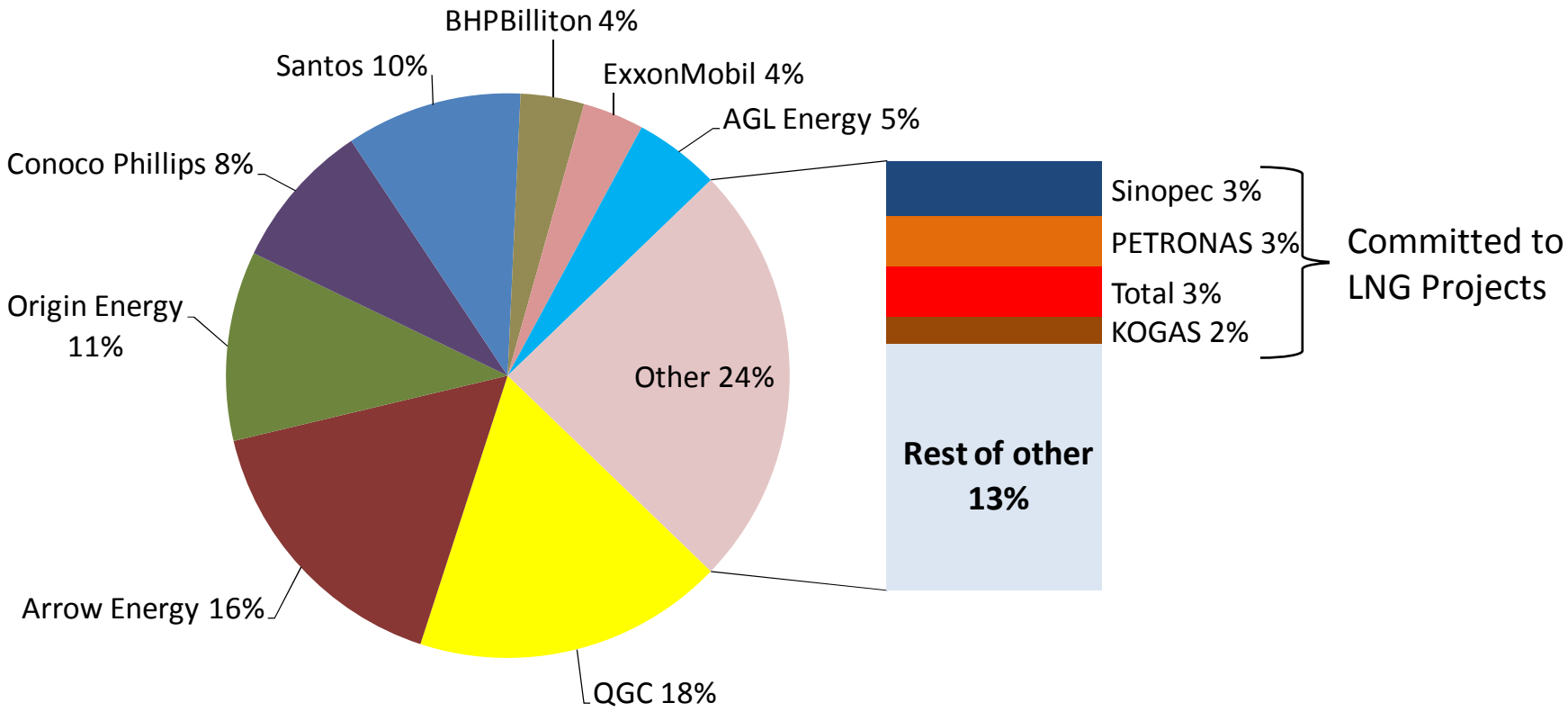
1P & 2P Gas Reserves by Company



Total: 48,736 PJ

Source: RLMS

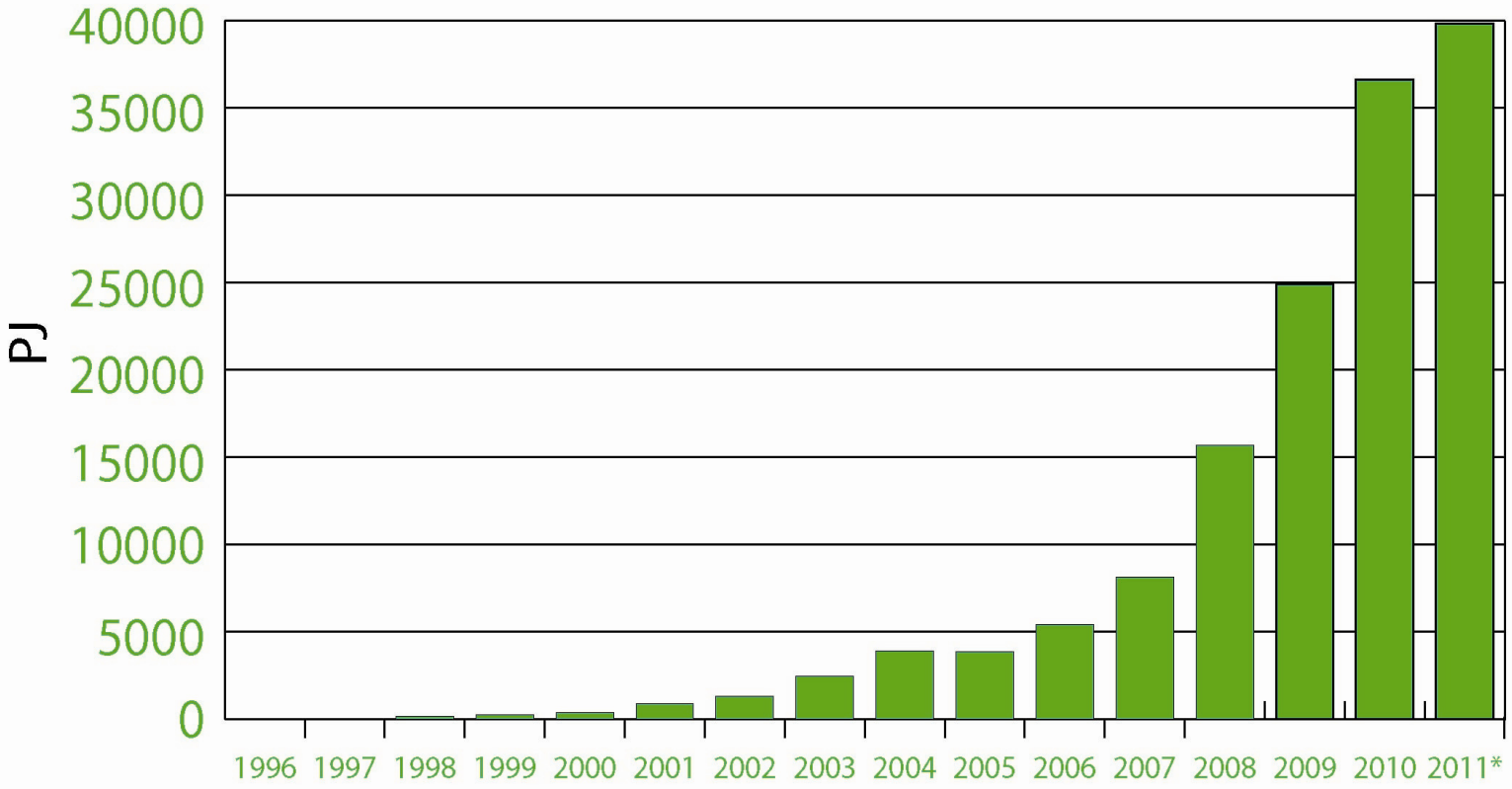
1P, 2P & 3P Gas Reserves by Company



Total: 73,795 PJ

Source: RLMS

Growth of 2P CSG Reserves in Eastern Australia in PJ (30 June 2011)



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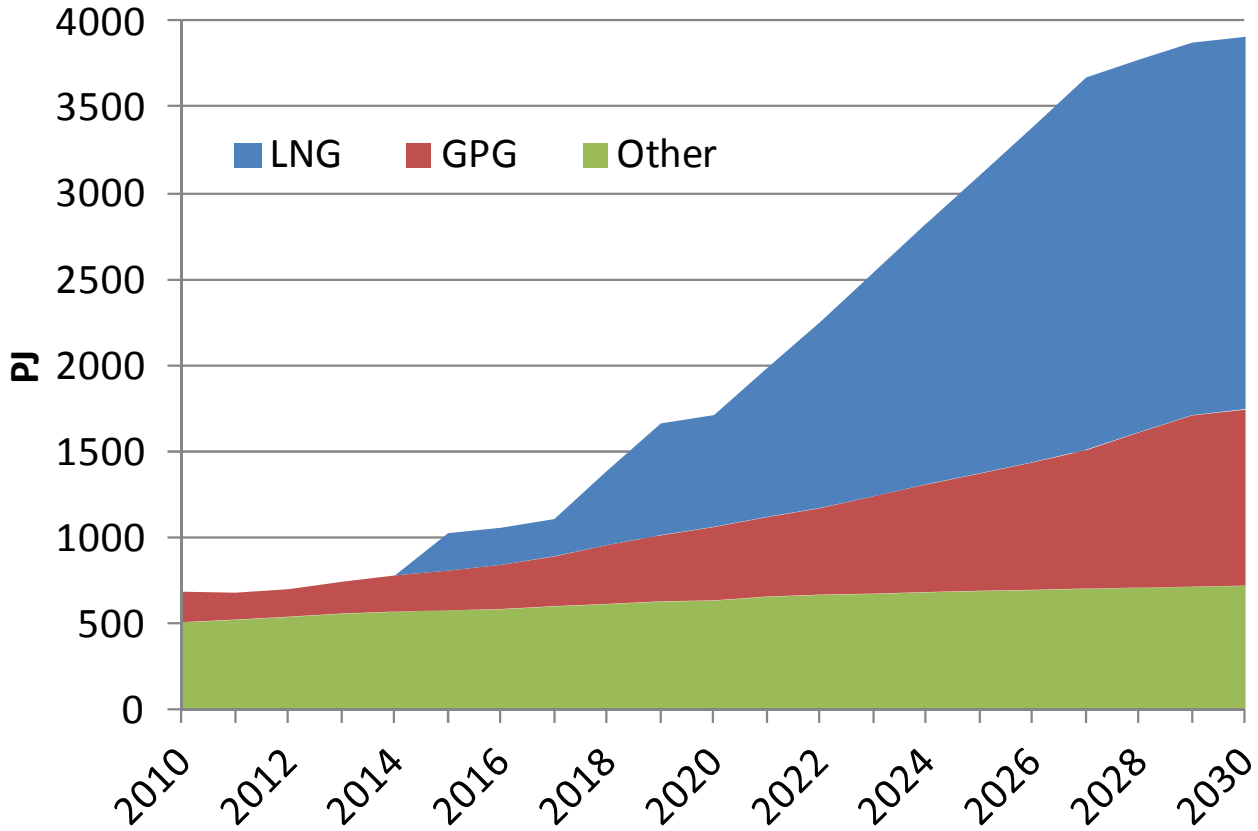
An LNG Perspective

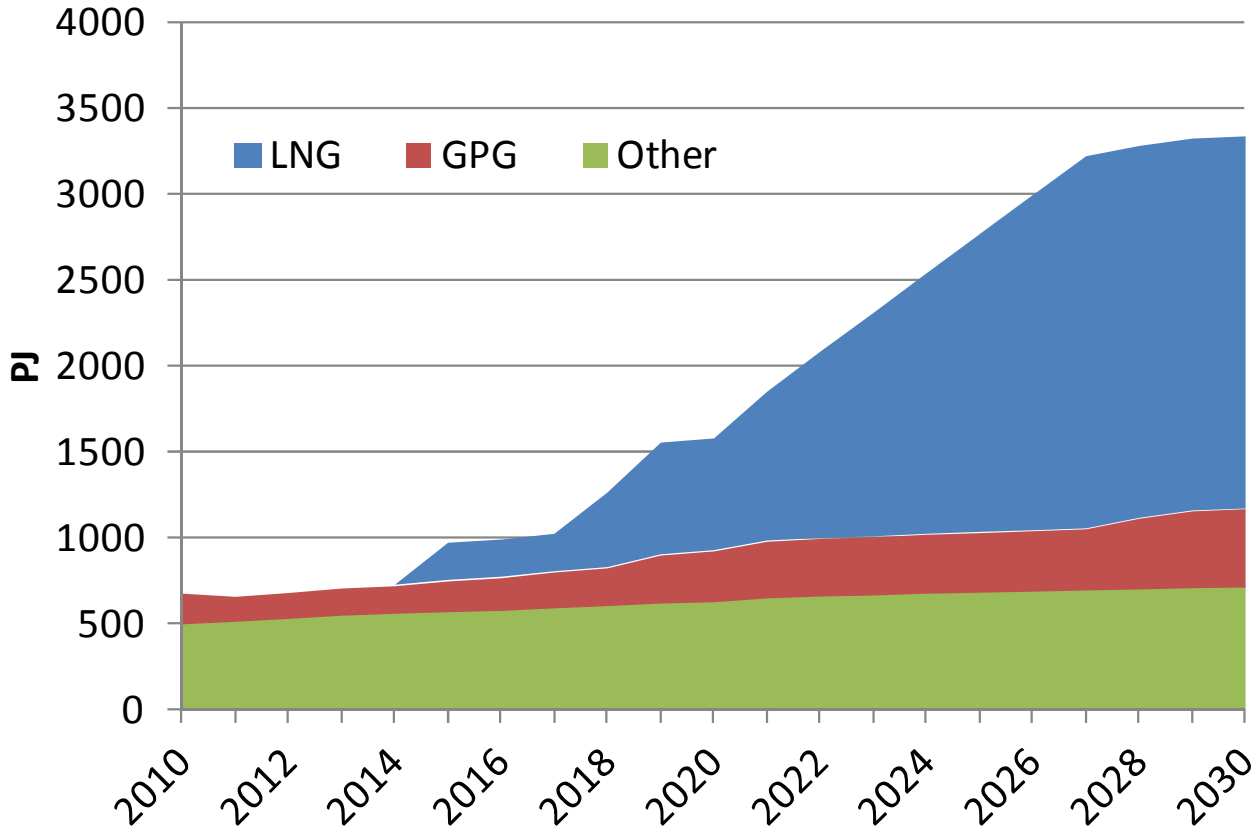
- Queensland LNG expected to swamp all other demand for gas in eastern Australia
- Reserves supporting LNG projects not yet sufficient for multiple trains for all projects
- LNG projects extremely capital intensive
- Australian projects entering into long term contracts with LNG buyers

Projection of Eastern Australian Annual Gas Demand – 2010 GSOO



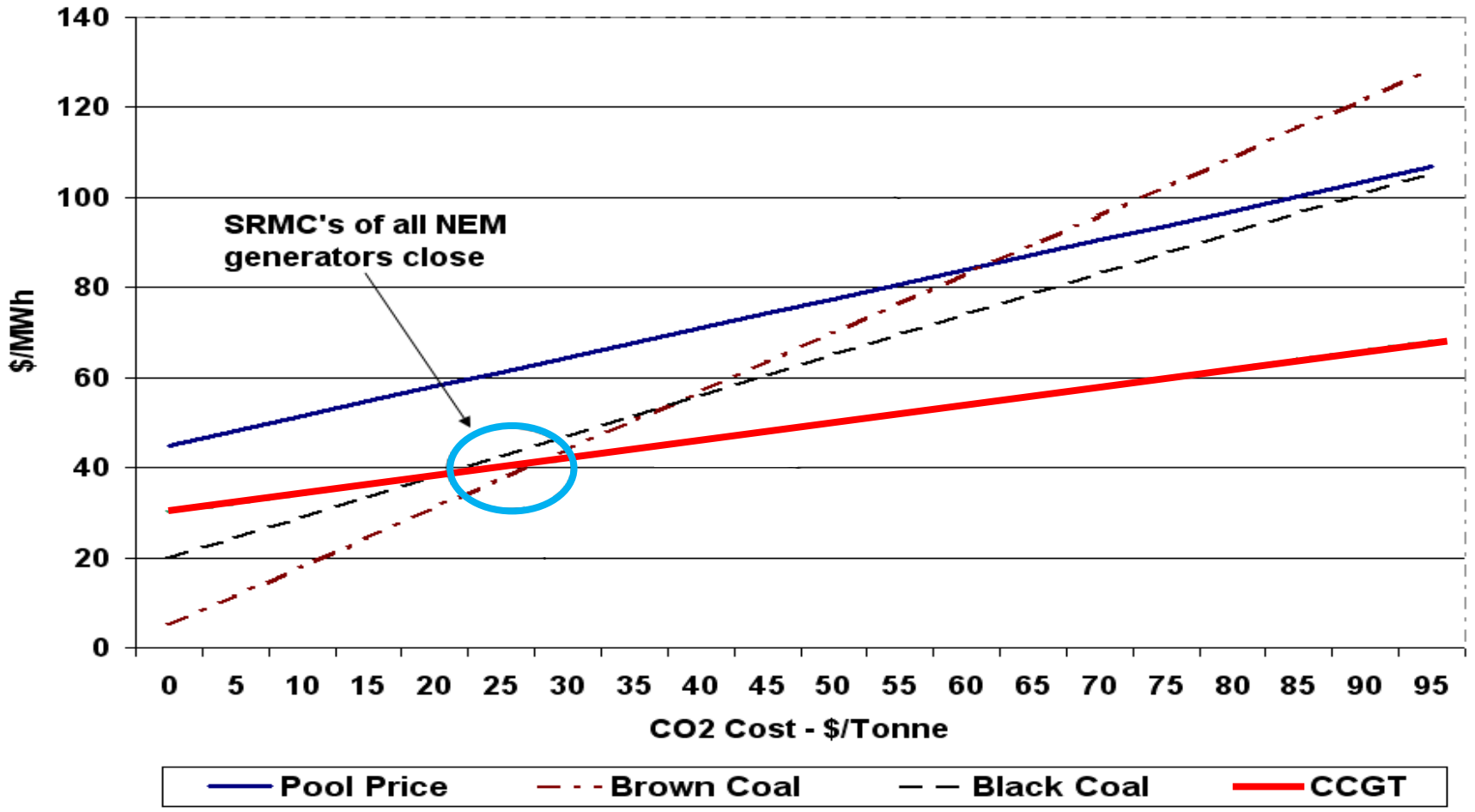
Source: AEMO GSOO 2010 (High LNG scenario)

Projection of Eastern Australian Annual Gas Demand – IES GPG forecast

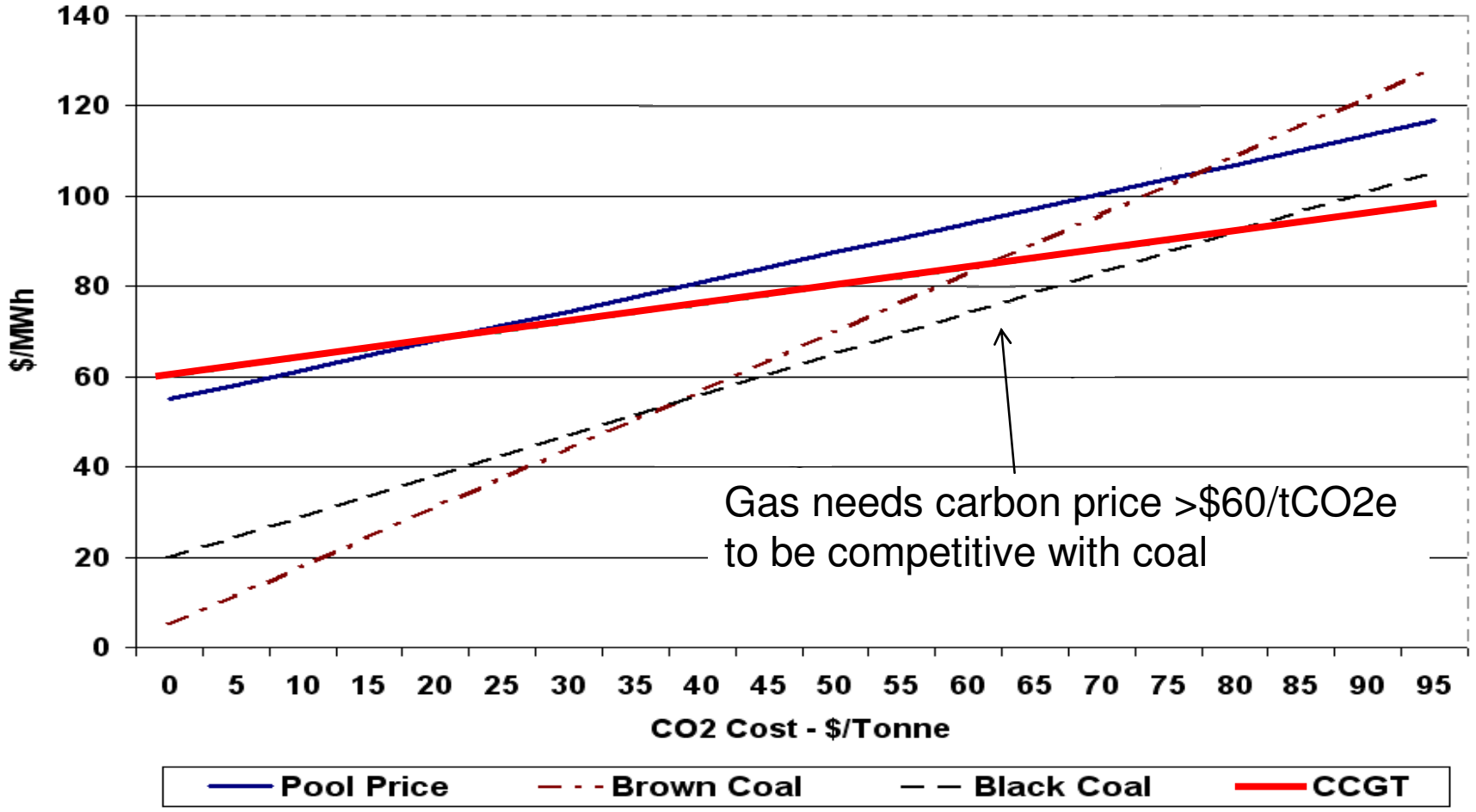


Source: AEMO GSOO 2010 (LNG, Other), IES (GPG - carbon prices $23 flat)

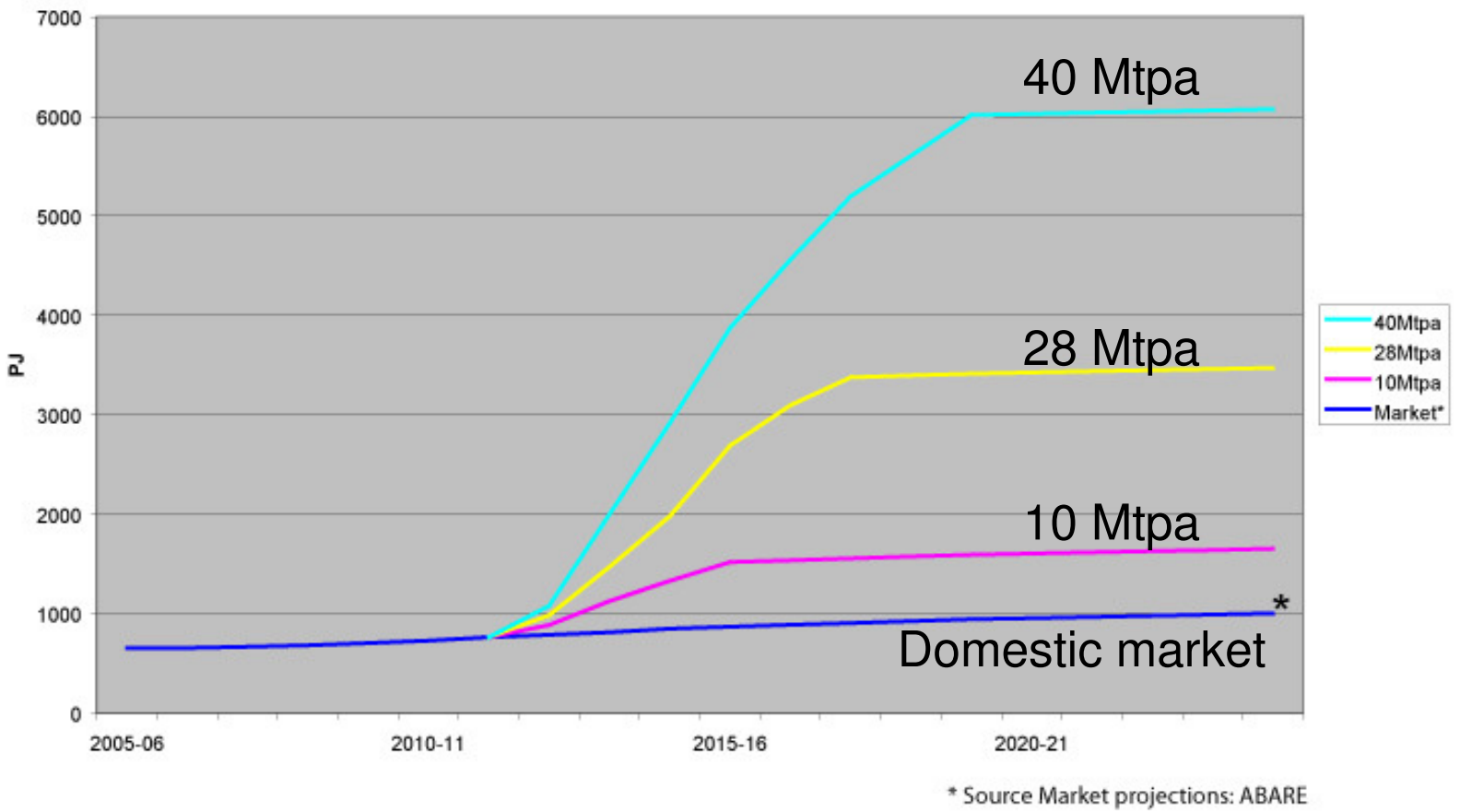
Merit Order and Carbon Costs
Gas cost at $3/GJ



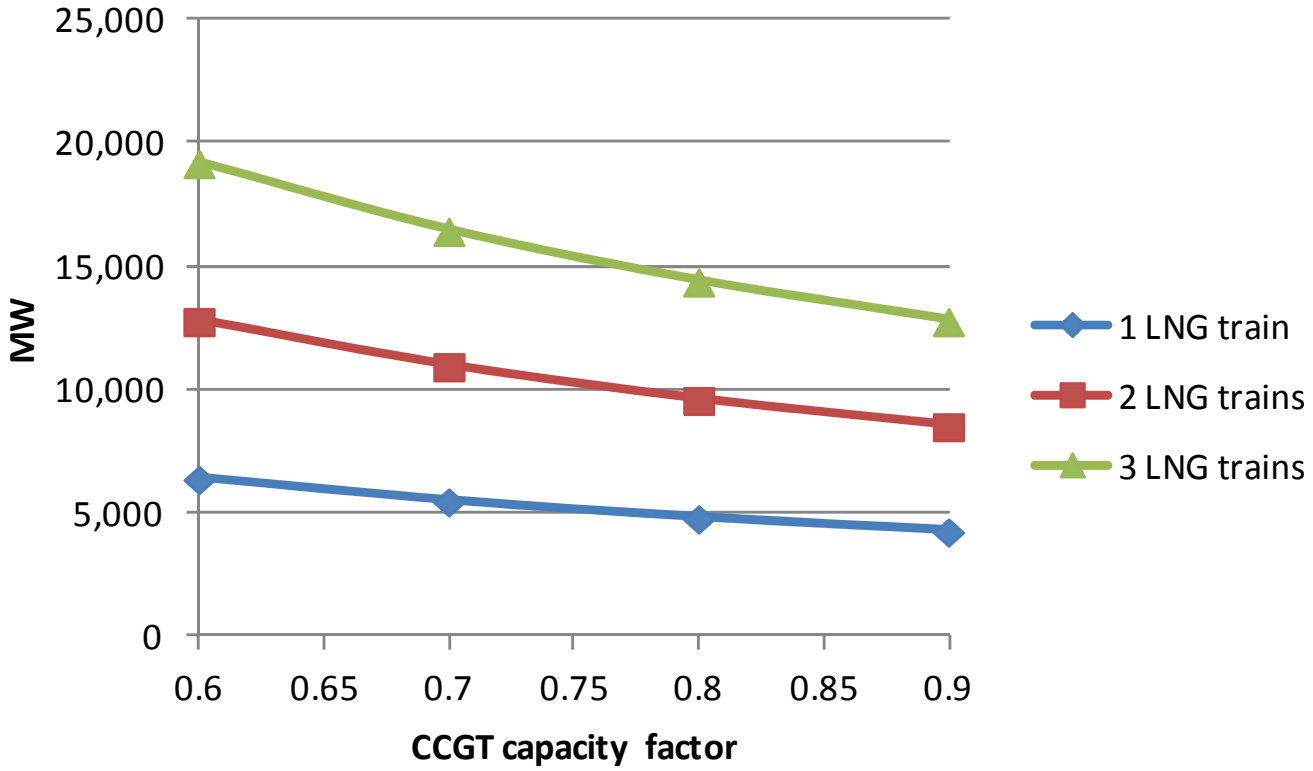
Merit Order and Carbon Costs
Gas Cost at $6/GJ



IMPACT OF LNG PROPOSALS



CCGT Plant Capacity for Equivalent Usage of Gas by 4mtpa LNG trains

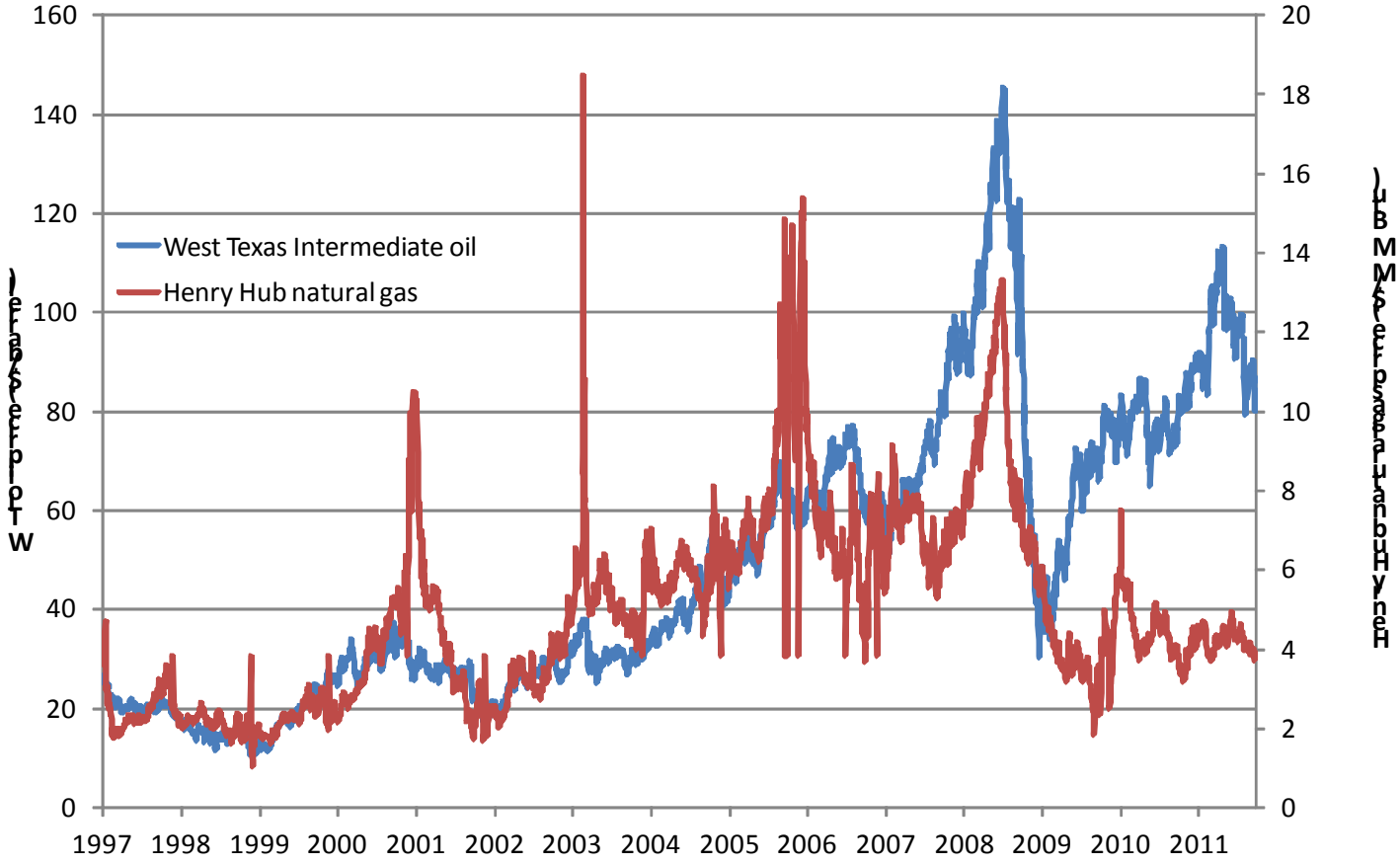


Note that Victoria's entire generation capacity is around 11,000 MW

Reserves for Queensland LNG

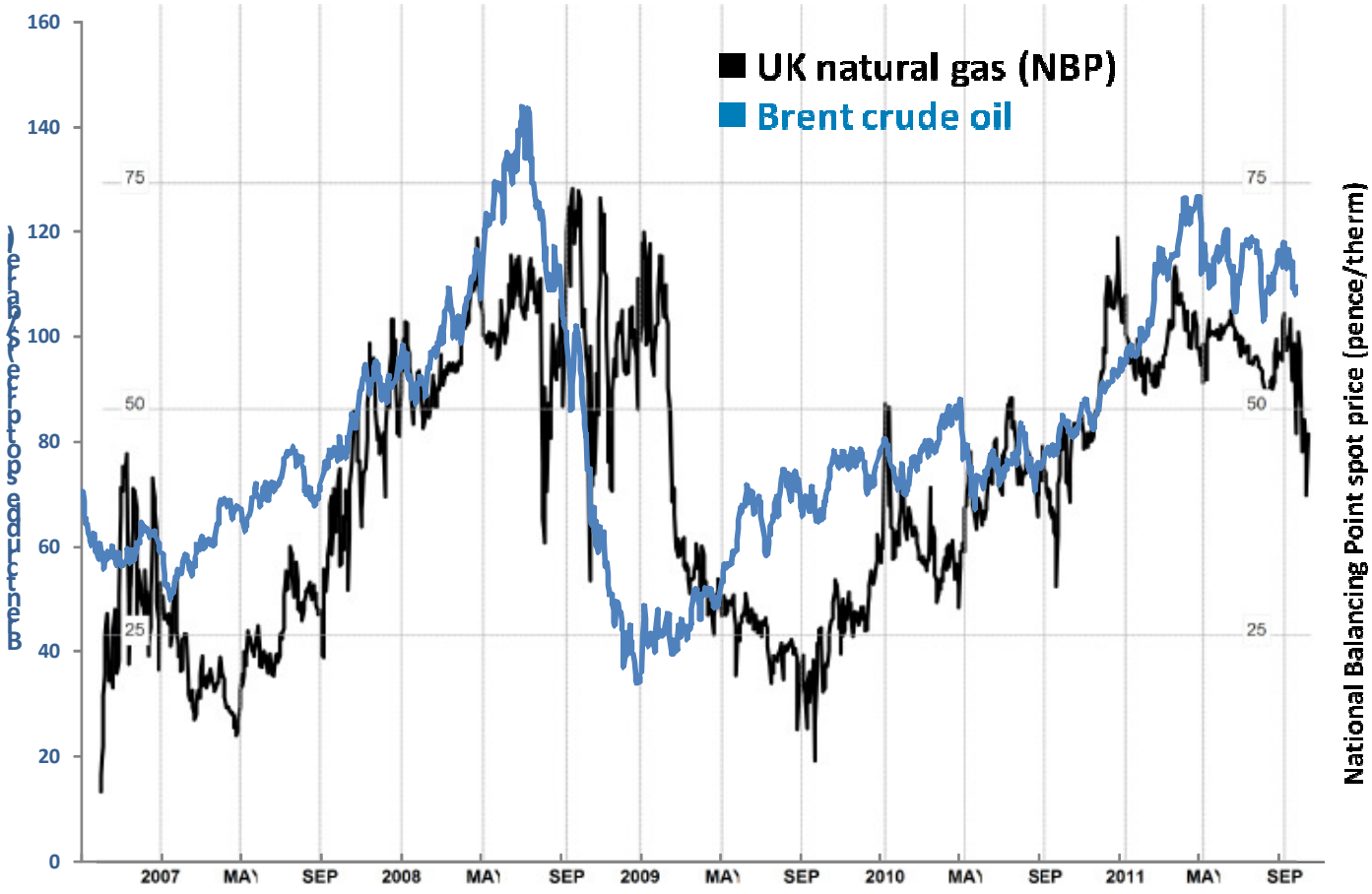
- Owners of the four major projects control about 90% of 2P CSG reserves
- Sufficient to support six trains of 4 million TPA each
- All projects based on two or more trains
- More reserves need to be proven or acquired

Oil vs Natural Gas Price – US market



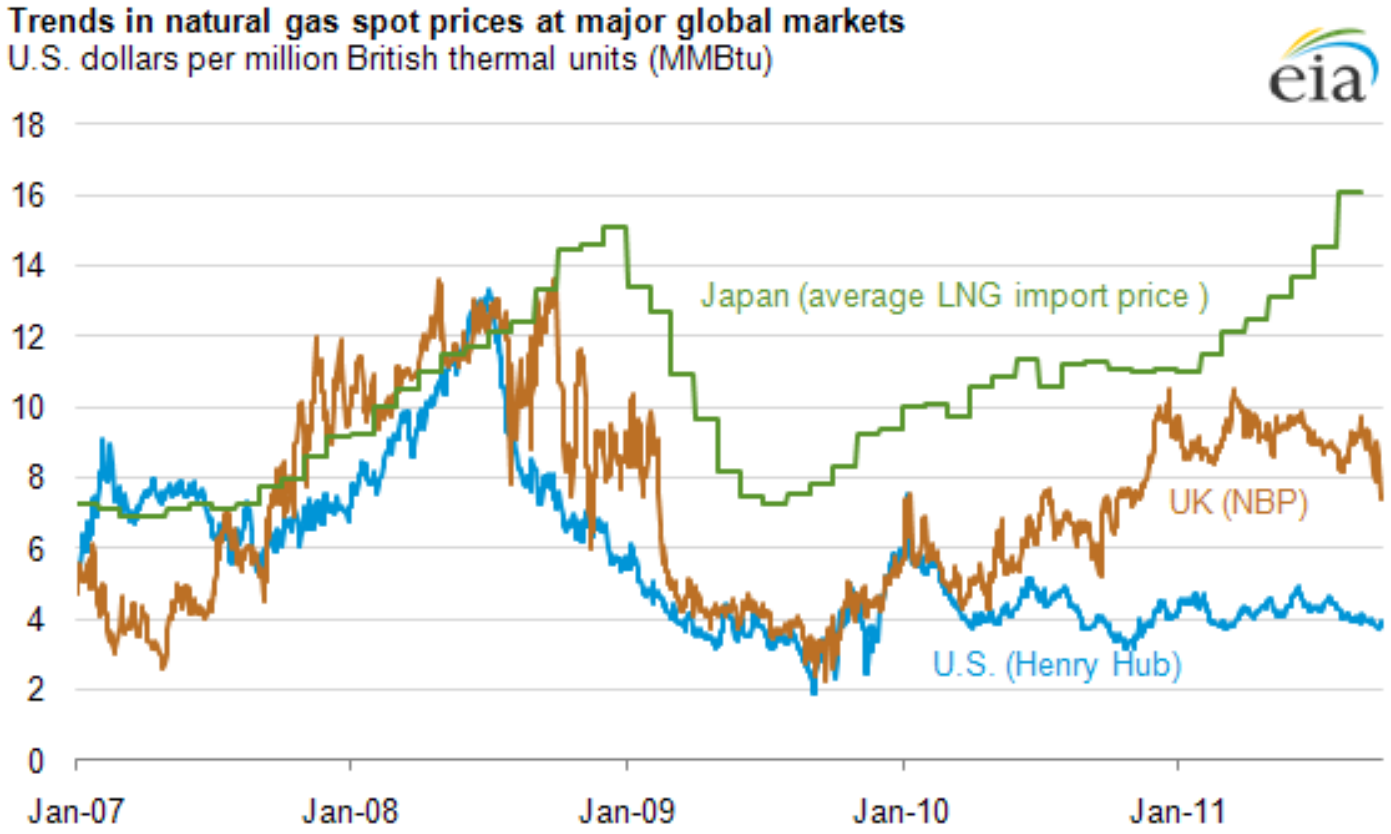
Source: U.S. Energy Information Administration

Oil vs Natural Gas Price – European Market



Sources: U.S. Energy Information Administration (Brent crude), Bloomberg (NBP natural gas)

Global Natural Gas Prices



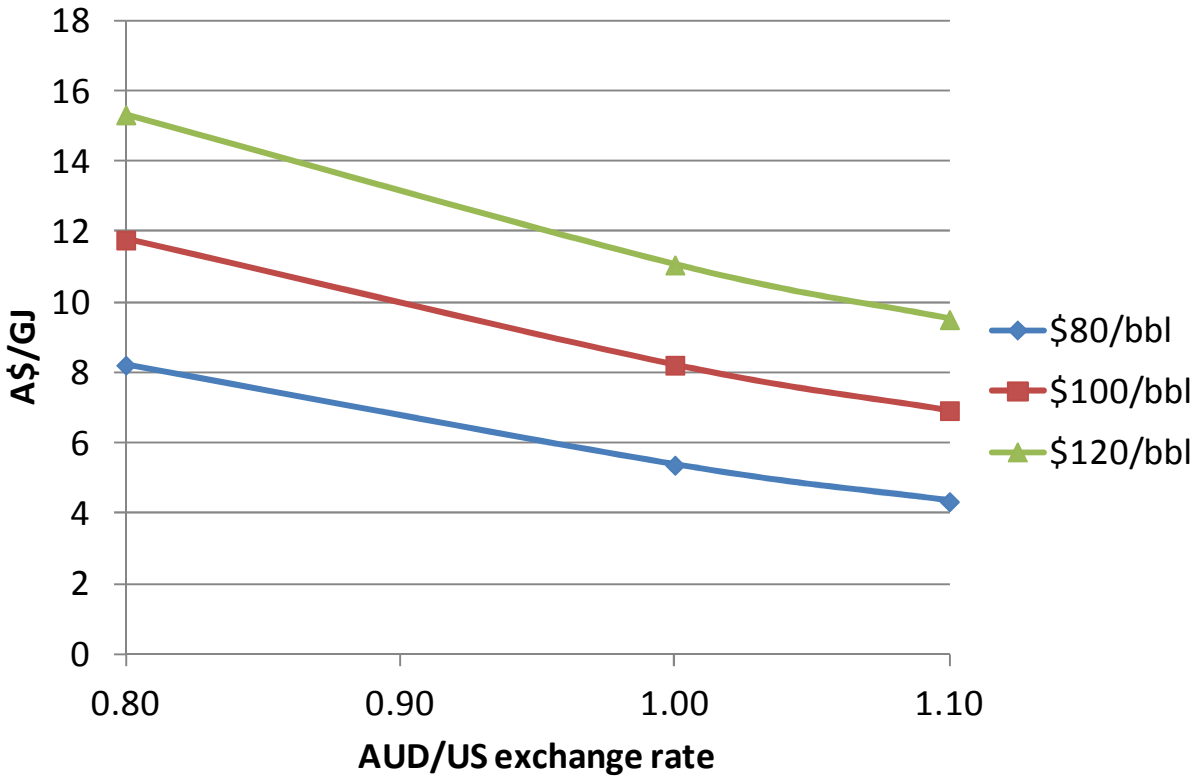
Source: U.S. Energy Information Administration

LNG Prices

LNG contract prices typically linked to oil prices

- Most East Asian LNG contracts set LNG price to 13-15% of JCC oil price
- Various mechanisms used to protect buyer from high oil prices and seller from low oil prices
- Will LNG and oil price become disconnected?
- Both sellers and buyers prefer to continue with linkage

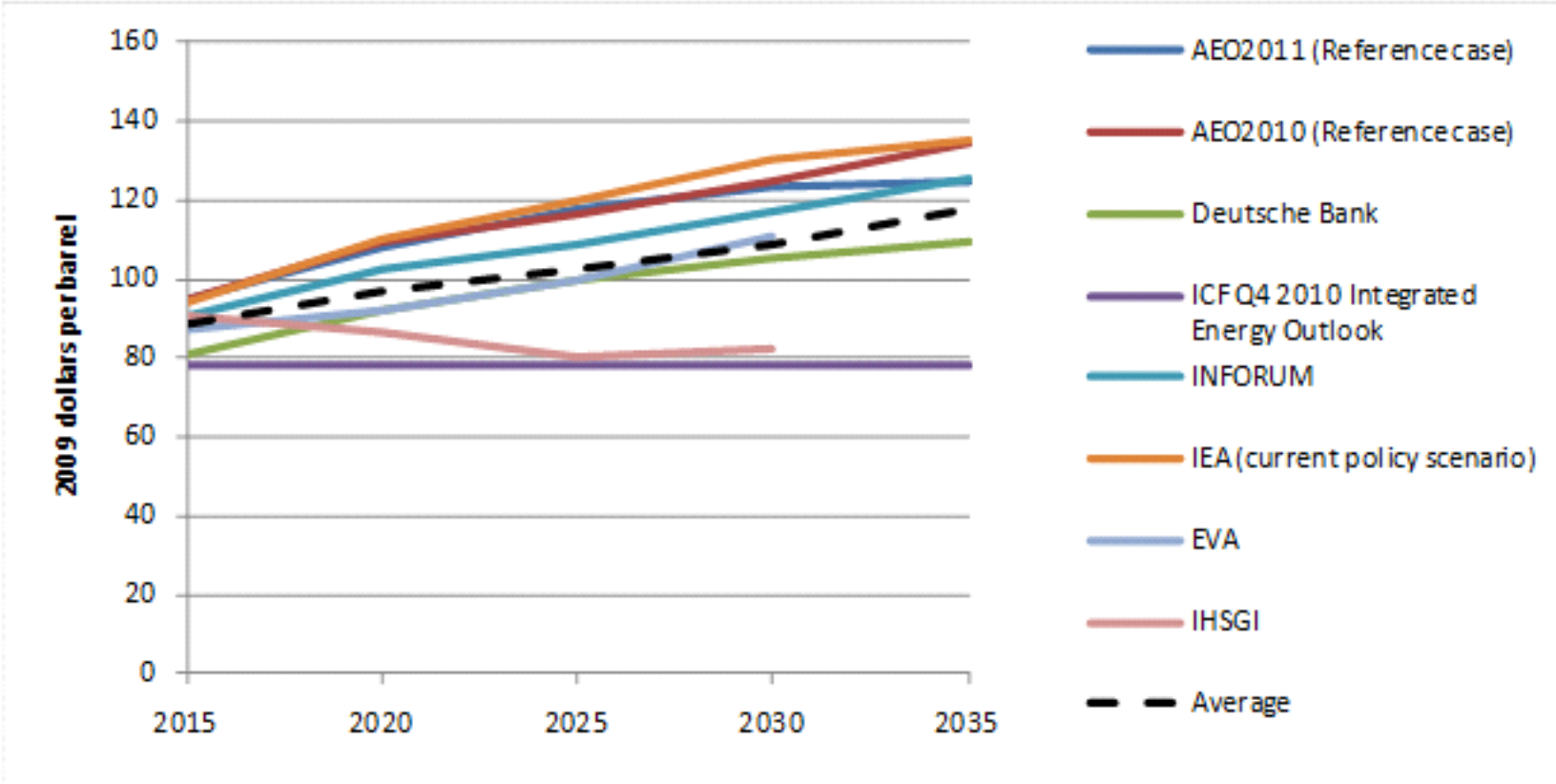
LNG Netback Prices vs. Exchange Rate for Various Oil Prices



This assumes:

- LNG price [USD/GJ] = oil price [USD/bbl] x 15%
- LNG netback price = LNG price - $6/GJ

Projections of World Oil Price (WTI) by Various Bodies

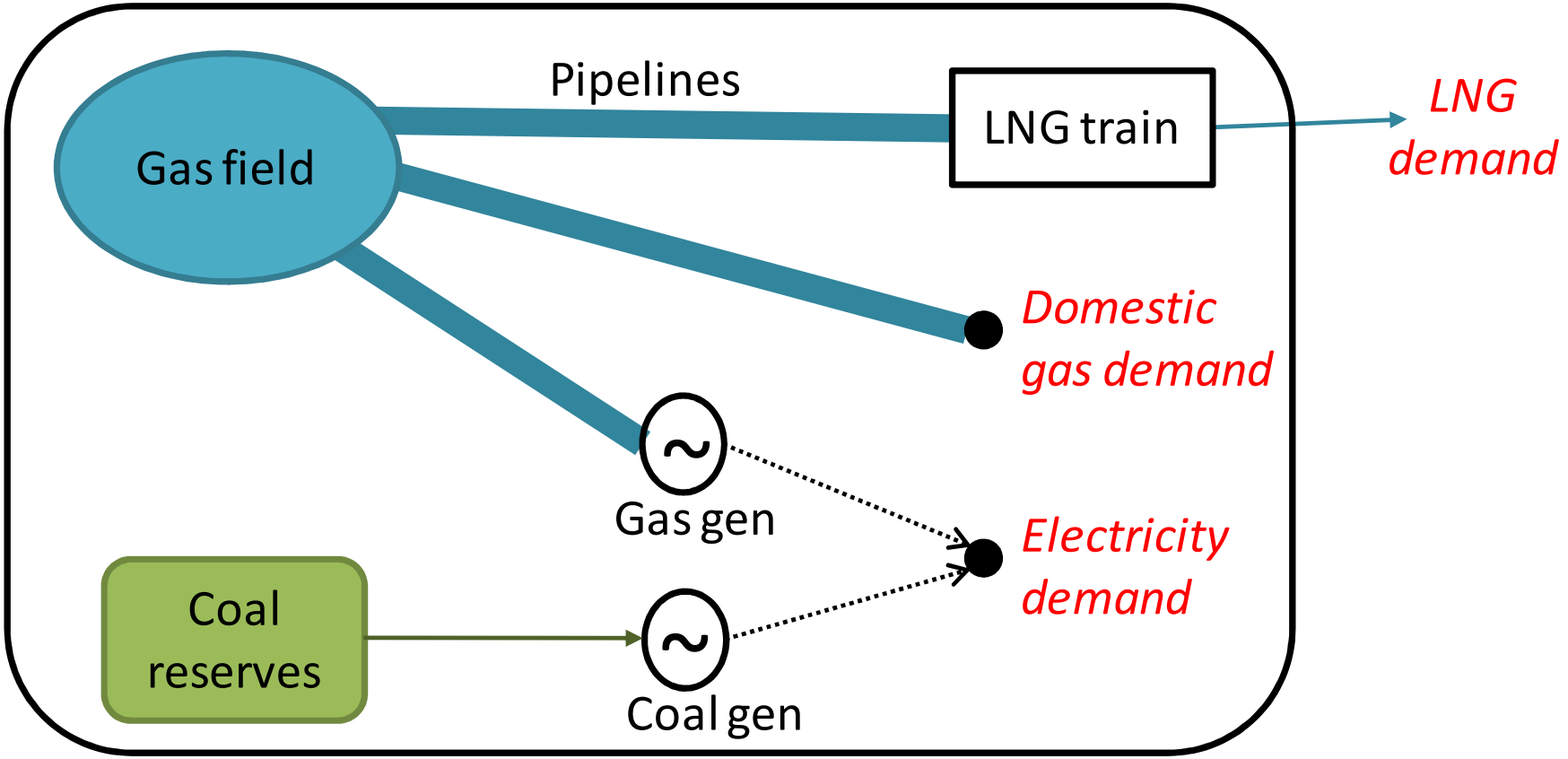


Source: Annual Energy Outlook 2011, U.S. Energy Information Administration

IES Integrated Gas-Electricity Model (IGEM)

- Long term, partial equilibrium, least cost model
- Model includes:
  - All major power stations (NEM, SWIS, DKIS) and interconnectors
  - All major gas basins and pipelines, domestic gas demand
  - Government policies including Carbon pricing, LRET scheme, Qld Gas Incentive Scheme, NSW GHG Abatement Scheme etc.
  - LNG export dynamics (international oil price, LNG train build rate limit, demand for LNG export etc.)
- Models co-optimised development of the Australian gas and electricity sectors
  - Allows analysis of the impact of LNG on the domestic gas and electricity sectors

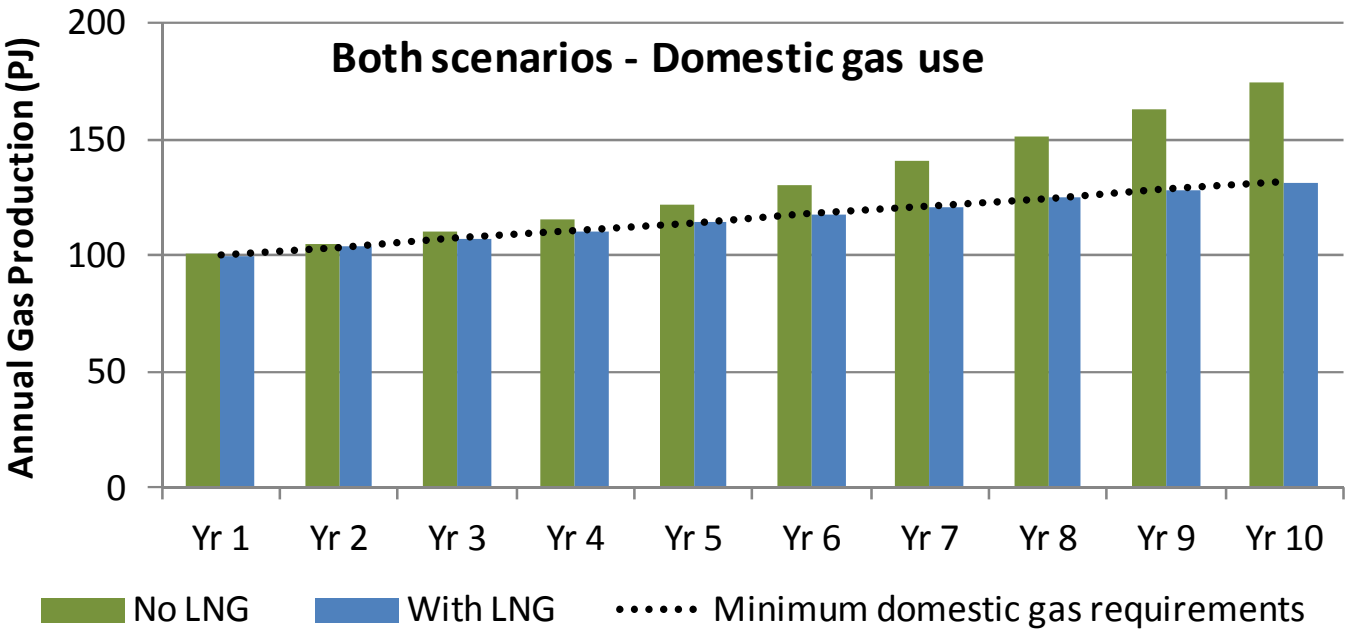
Simple Demonstration Example

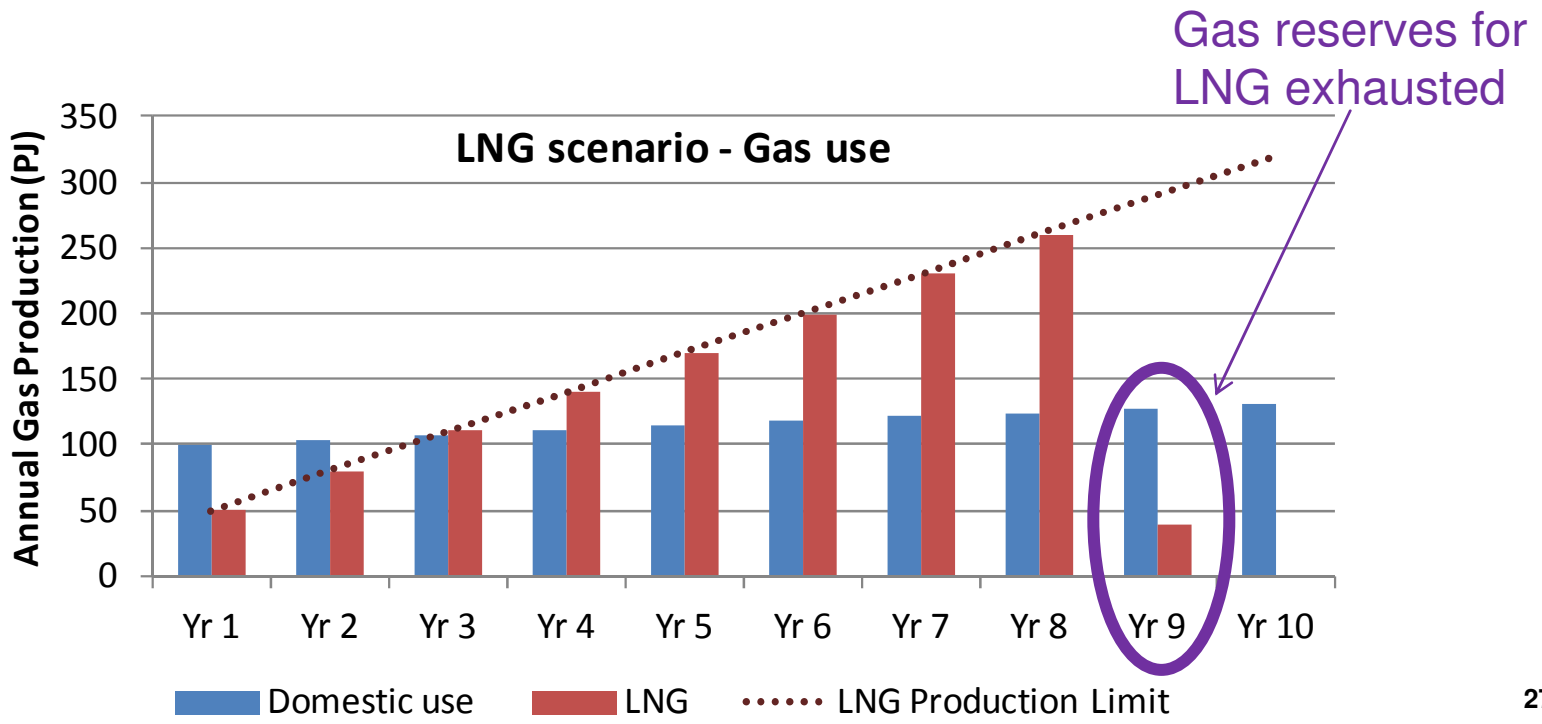


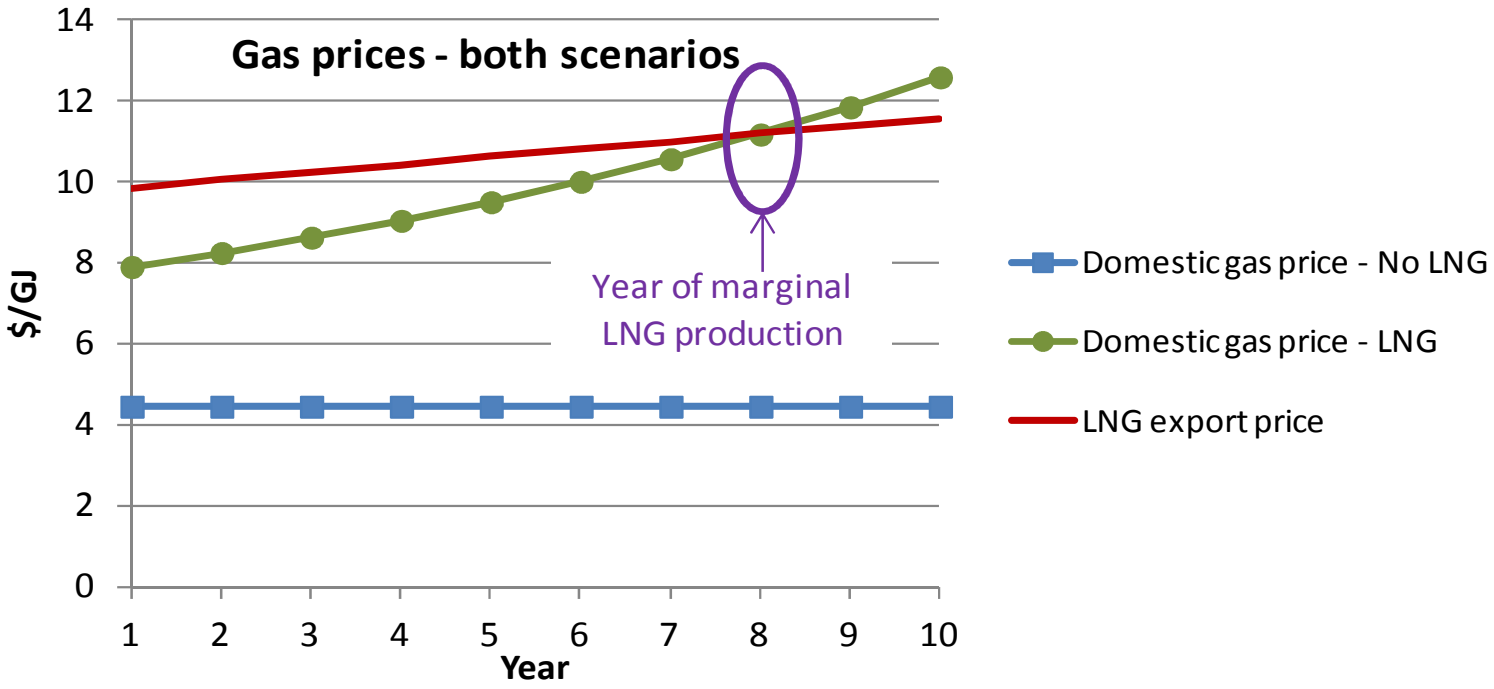
Scenarios

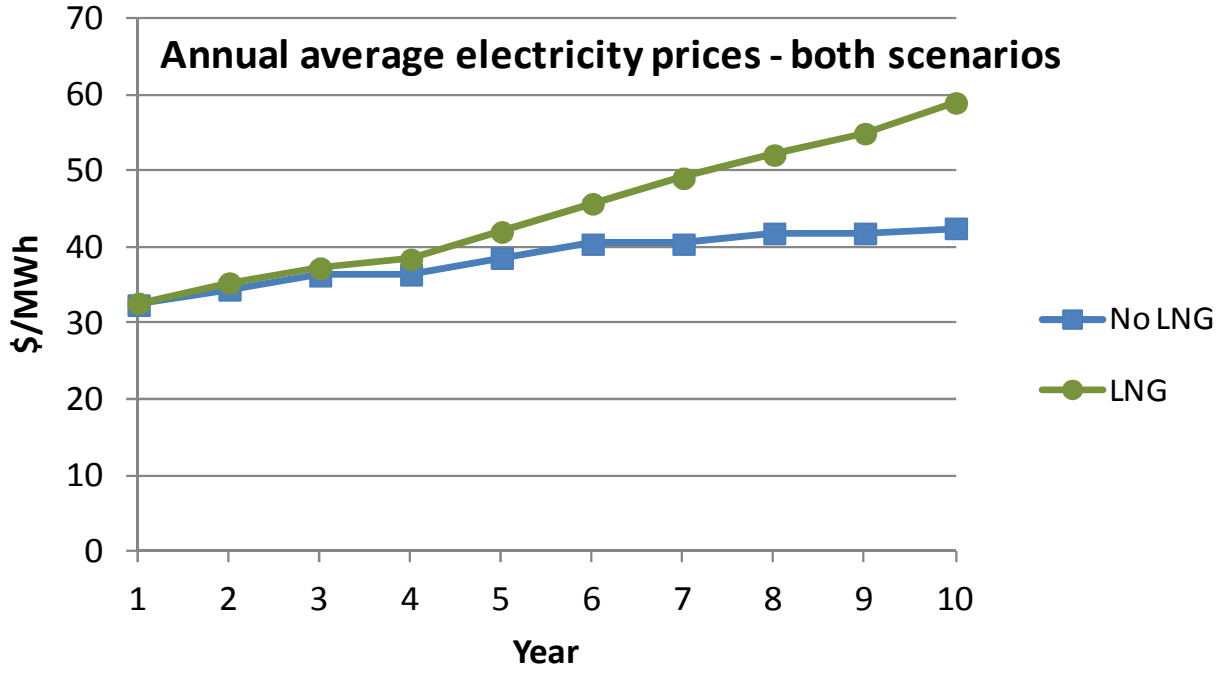
- Two scenarios – with and without LNG exports
  - Gas reserves insufficient to fully supply both domestic and LNG demand
  - Domestic gas and electricity demands must be met
  - Exogenous LNG export price, LNG train build rate limited

- Results:
  - Gas production for Domestic use & LNG export
  - Domestic gas prices


Both scenarios - Domestic gas use
Annual Gas Production (PJ)
200
150
100
50
0
Yr 1
Yr 2
Yr 3
Yr 4
Yr 5
Yr 6
Yr 7
Yr 8
Yr 9
Yr 10
No LNG
With LNG
Minimum domestic gas requirements


Gas reserves for LNG exhausted
LNG scenario - Gas use
Annual Gas Production (PJ)
350
300
250
200
150
100
50
0
Yr 1
Yr 2
Yr 3
Yr 4
Yr 5
Yr 6
Yr 7
Yr 8
Yr 9
Yr 10
Domestic use
LNG
LNG Production Limit


Gas prices - both scenarios
$/GJ
Year
Year of marginal LNG production
Domestic gas price - No LNG
Domestic gas price - LNG
LNG export price


Annual average electricity prices - both scenarios
$/MWh
Year
No LNG
LNG

Who Has Invested in GPG Recently?

Only parties integrated upstream, downstream or both

Station	Type	Region	Capacity	Commissioned	Company
Bell Bay 3	GT	TAS	105	2006	Aurora
Laverton North	GT	VIC	312	2006	Snowy Hydro
Braemar	GT	QLD	504	2007	ERM
Tallawarra	CC	NSW	460	2008	TRUEnergy
Uranquinty	GT	NSW	664	2008	Origin
Braemar 2	GT	QLD	519	2009	ERM
Tamar OCGT	GT	TAS	58	2009	Alinta Energy → Aurora
Colonga GT	GT	NSW	724	2009	Delta Electricity
Tamar CCGT	CC	TAS	208	2009	Alinta Energy → Aurora
Yarwun Cogen	Cogen	QLD	160	2010	Rio Tinto Alcan
Darling Downs	CC	QLD	630	2010	Origin
Mortlake OCGT	GT	VIC	550	2011	Origin

Concluding Remarks

- Caveat: LNG prices will not collapse, land-owner issues will be largely resolved even if at a cost
- Gas prices will probably approach LNG netback prices
- Electricity prices will rise due to increased gas and carbon costs
- Existing coal-fired generation will remain viable under projected carbon prices
- Only parties with integration synergies are likely to invest in gas fired generation