A Review of Downstream Natural Gas Portfolio Selection Criteria in Trinidad and Tobago

Edward Bahaw and Sherry-Ann S. Ganase

Conference on the Economy

October 13th -14th 2016

The University of the West Indies
St. Augustine

THE UNIVERSITY OF TRINIDAD AND TOBAGO

Agenda

- Background to downstream industries
- Review of downstream portfolio selection criteria
- New realities facing the natural gas industry
- Historical analysis of downstream sub sectors:
  - ✓ Efficiency – Output per bcf
  - ✓ Employment – Headcount per bcf
  - ✓ Value – Output value per bcf
- Conclusions/Recommendations

Background to Downstream Industries

- Upstream Gas discoveries
- State led downstream investments
- Technical and marketing challenges
- Structural adjustments and privatization
- FDI led downstream investments
- Financial incentives

Upstream Natural Gas

- Discoveries
  - ✓ Late 1960s
  - ✓ 1970s
  - ✓ 1990s
  - ✓ Early 2000s

Natural Gas Monetization

- Previously vented/flared – no value
- Government policy - create value
- Development of markets – export oriented
- Investments in infrastructure

Best Use of Our Petroleum Resources, 1975

- Government conference
- Expansions/Upgrades to:
  - ✓ Power Generation
  - ✓ Ammonia and urea production
  - ✓ Petroleum refining
  - ✓ Cement production
- Establishment of export based plants for:
  - ✓ Alumina
  - ✓ Iron and steel
  - ✓ Methanol
  - ✓ LNG

Source: Boopsingh et al, 2014

Downstream Selection Criteria

- Energy efficiency
- Local content
- Employment
- Value added
- Environmental Impact
- See Baisden (2002), Julien (2005), Baisden (2007), Jobity (2013) and Boopsingh (2014)

State Projects Implemented

- Electricity expansion
- Production of DRI (ISCOTT, 1980)
- Ammonia (1977, 1981, 1984, 1988)
- Urea (1983)
- Methanol (1984)
- Cement (1984)

Subsequent Downstream Developments

- State Divestments (Late 1980s to early 1990s)
- Product related price formula (1987)
- Methanol (1993, 1996, 1998, 1999 & 2004)
- Ammonia (1996, 1998, 2002, 2004 & 2005)
- LNG (1999, 2002, 2003 & 2005)

Proposals by GCA 2002

- Methanol & Ammonia - no additional expansion
- LNG - continued expansion
- Gas-to-liquids - limited state support
- Iron ore reduction & Aluminum - employment
- Power - Price electricity to recover costs.
- Ethylene and polyethylene - world-scale plant
- LPG - Continue Caribbean sales expansion
- CNG - development of Caribbean markets
- Added value products: private investment

Source: Oil and Gas Journal, 2004

Recent Private Sector Proposals

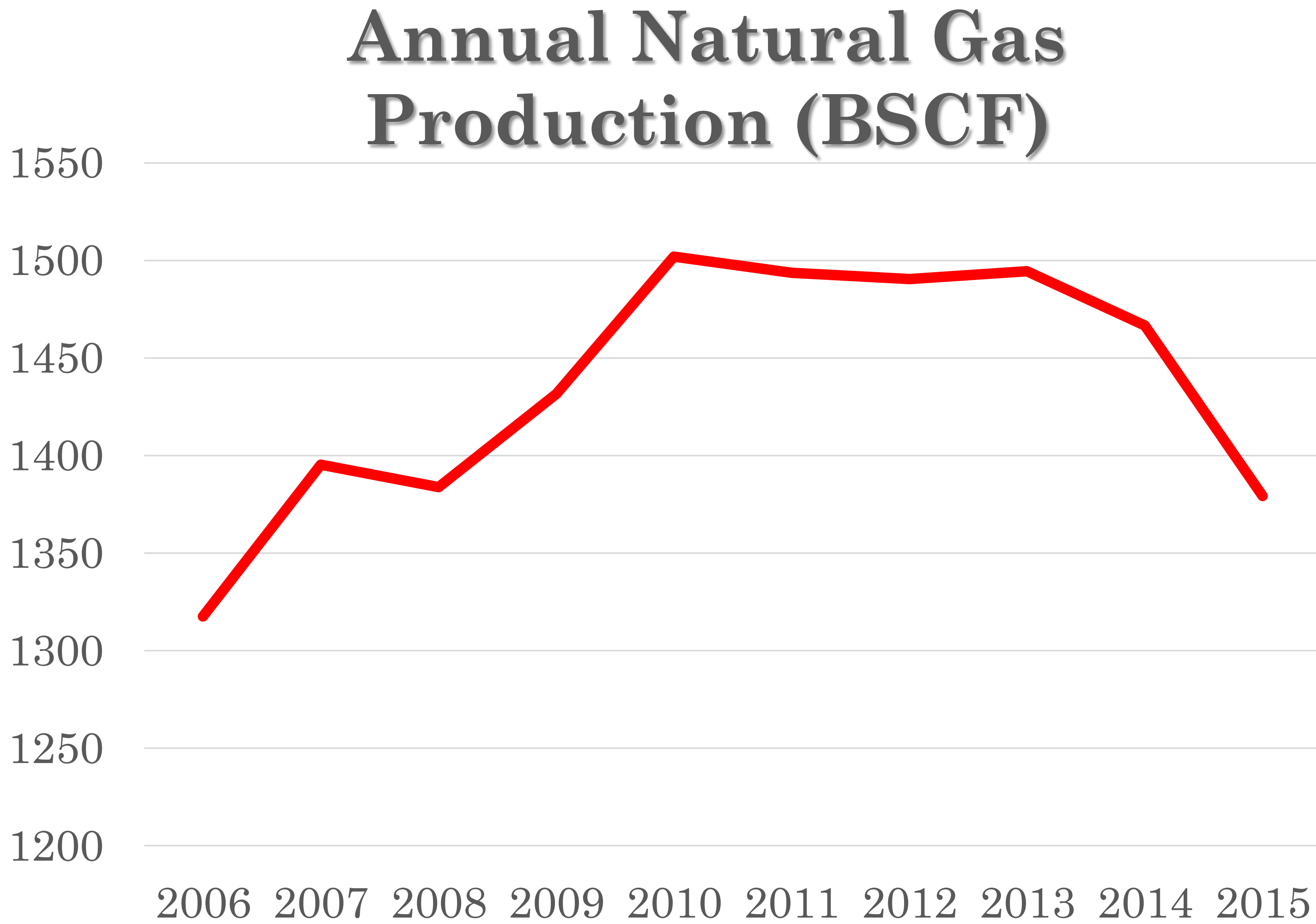
Downstream Output	**Company**
Methanol, propylene & polypropylene	Lurgi/Basell
Ethylene & Polyethylene	Westlake
Ammonia, UAN, Melamine	MHTL, AUM I (2010)
Ammonia, urea, ammonia sulfate	MHTL, AUM II
Steel	Essar
Bitumen to Synthetic Crude	Reliance Industires Limited
Aluminum Smelter	ALCOA
Aluminum Smelter	Alutrint
Calcium Cholride	Carisal
Maleic Acid	Isegen

UPSTREAM NATURAL GAS – NEW REALITIES

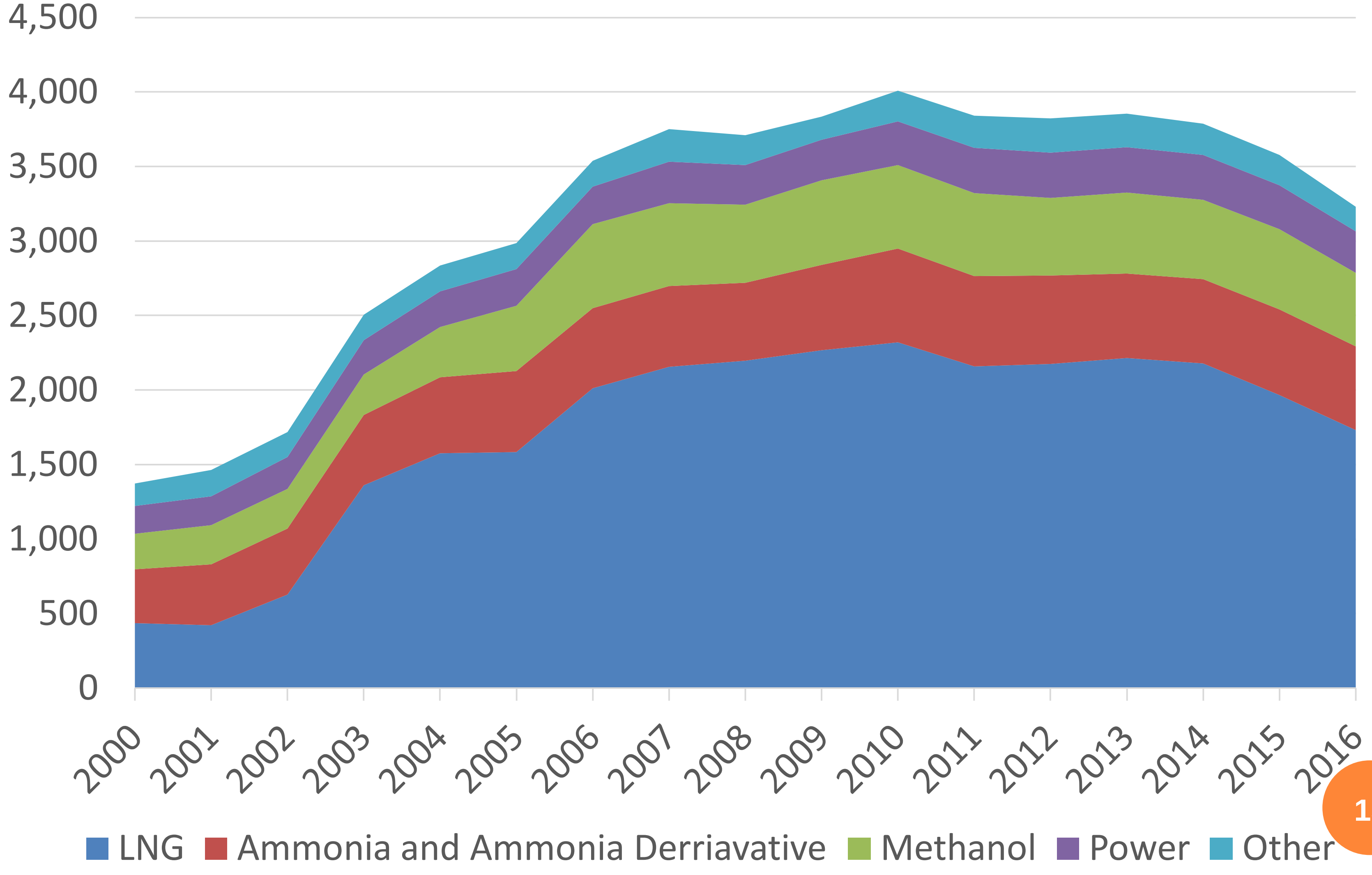
- No **<u>major</u>** gas discovery since early 2000s
- Depleted larger fields
- Declining natural gas production in T&T
- Higher cost of upstream production
  - ✓ Smaller fields
  - ✓ Aging infrastructure
  - ✓ Lower condensate yields

UPSTREAM NATURAL GAS – NEW REALITIES

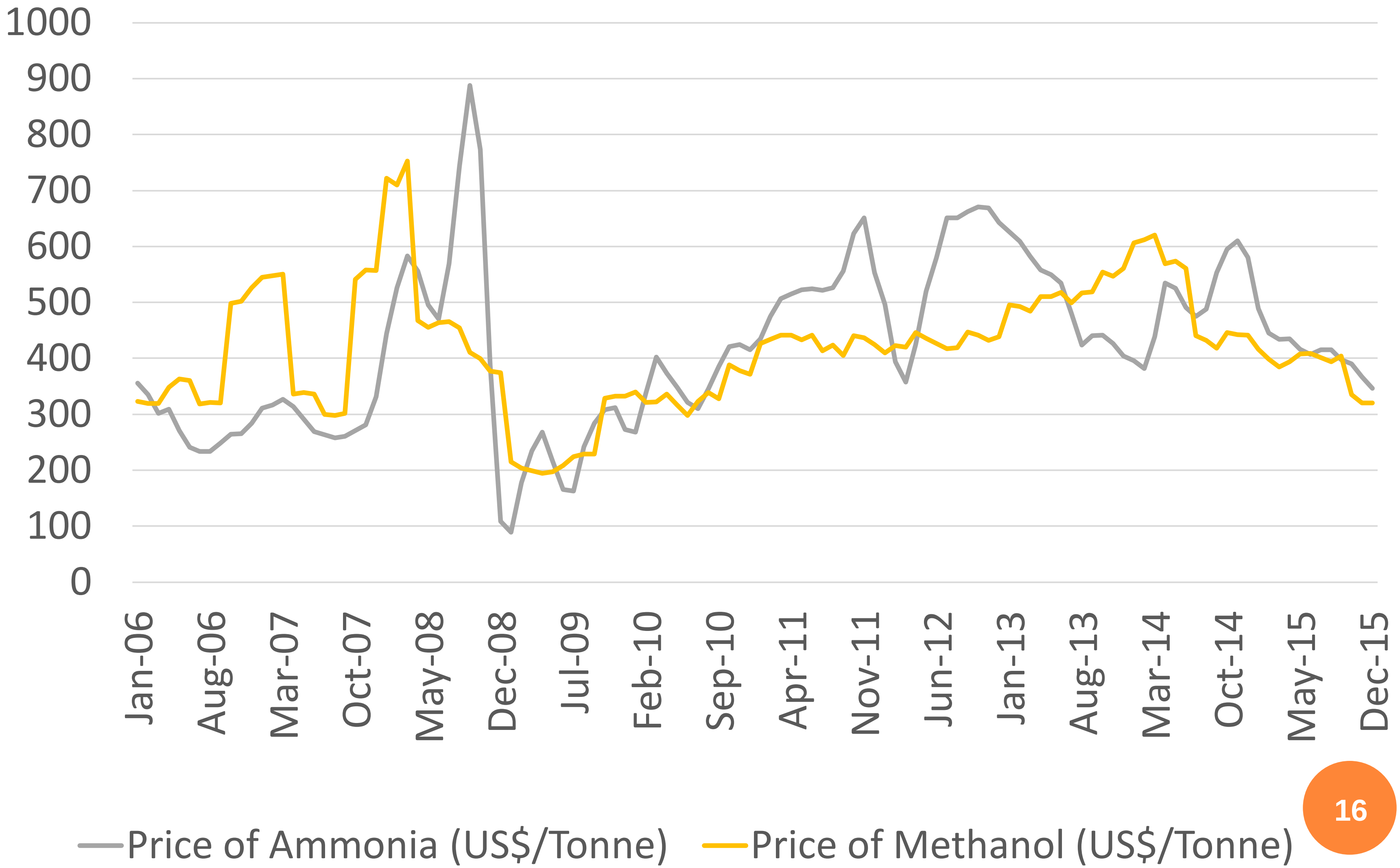
- Needs relative higher gas prices for feasibility
- Availability of cheap natural gas in other countries
- Investments in primary petrochemicals globally
- Not business as usual


Annual Natural Gas
Production (BSCF)
1550
1500
1450
1400
1350
1300
1250
1200
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015

Natural Gas Utilisation in T&T



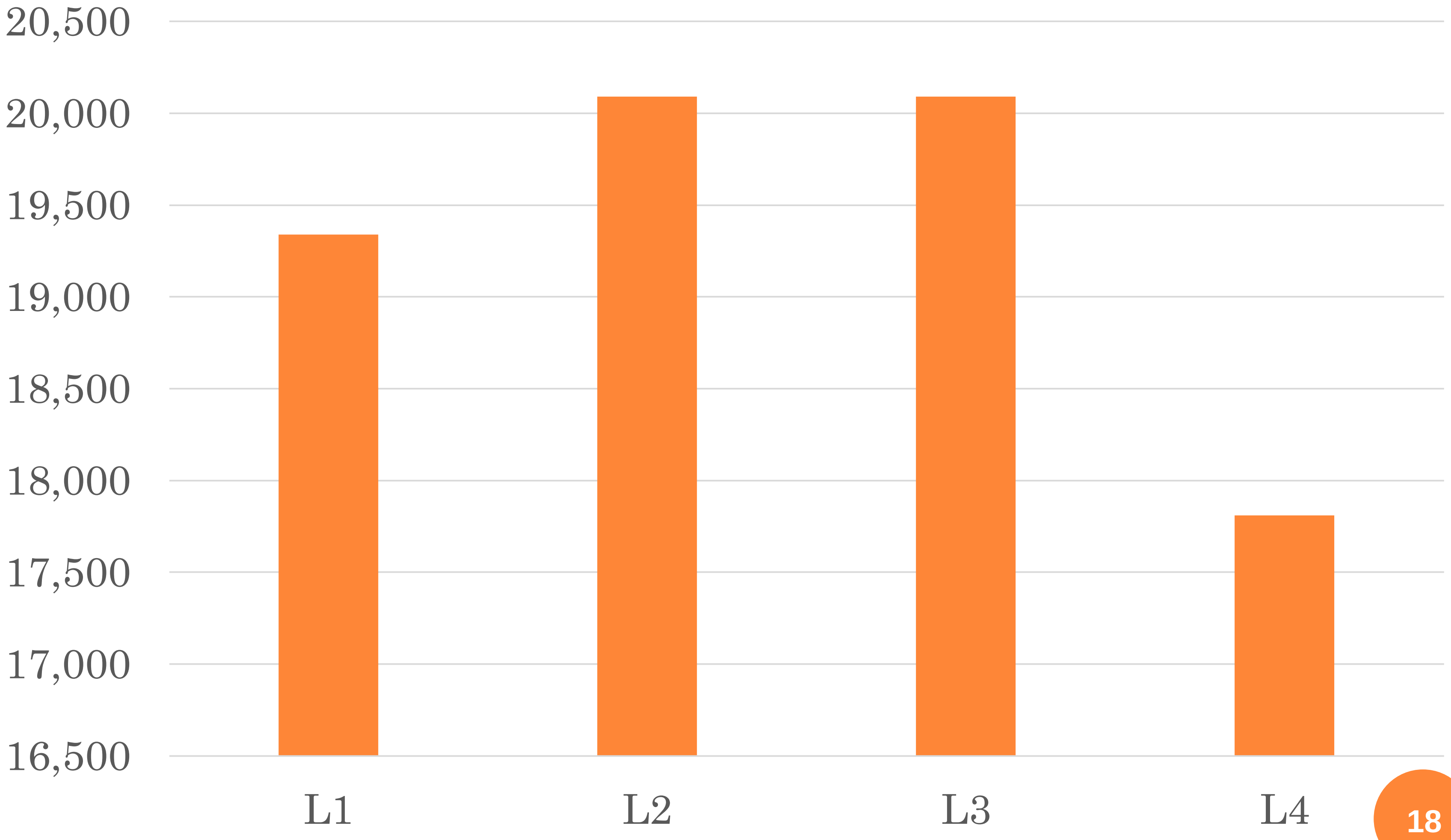
Ammonia and Methanol Prices

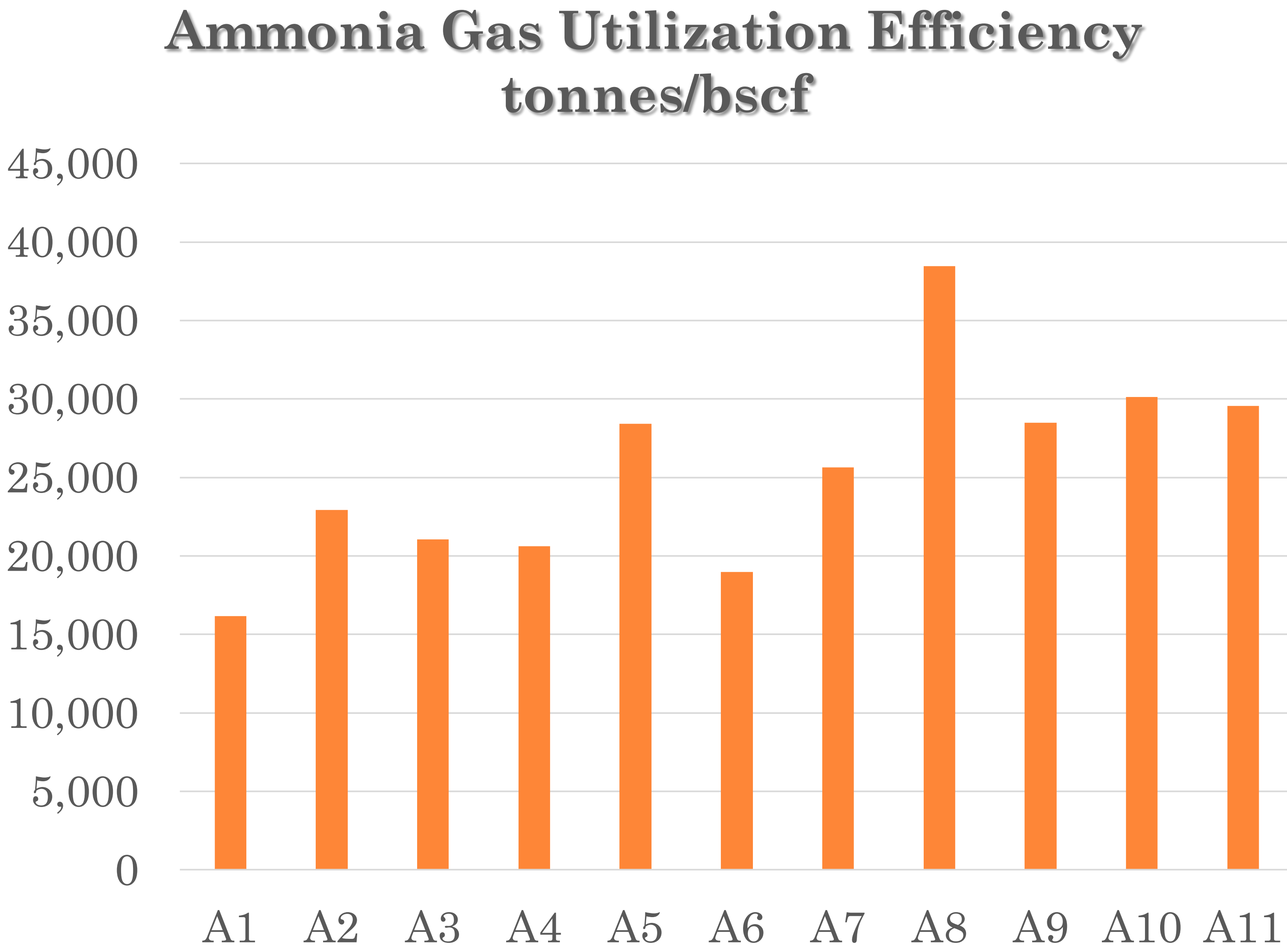


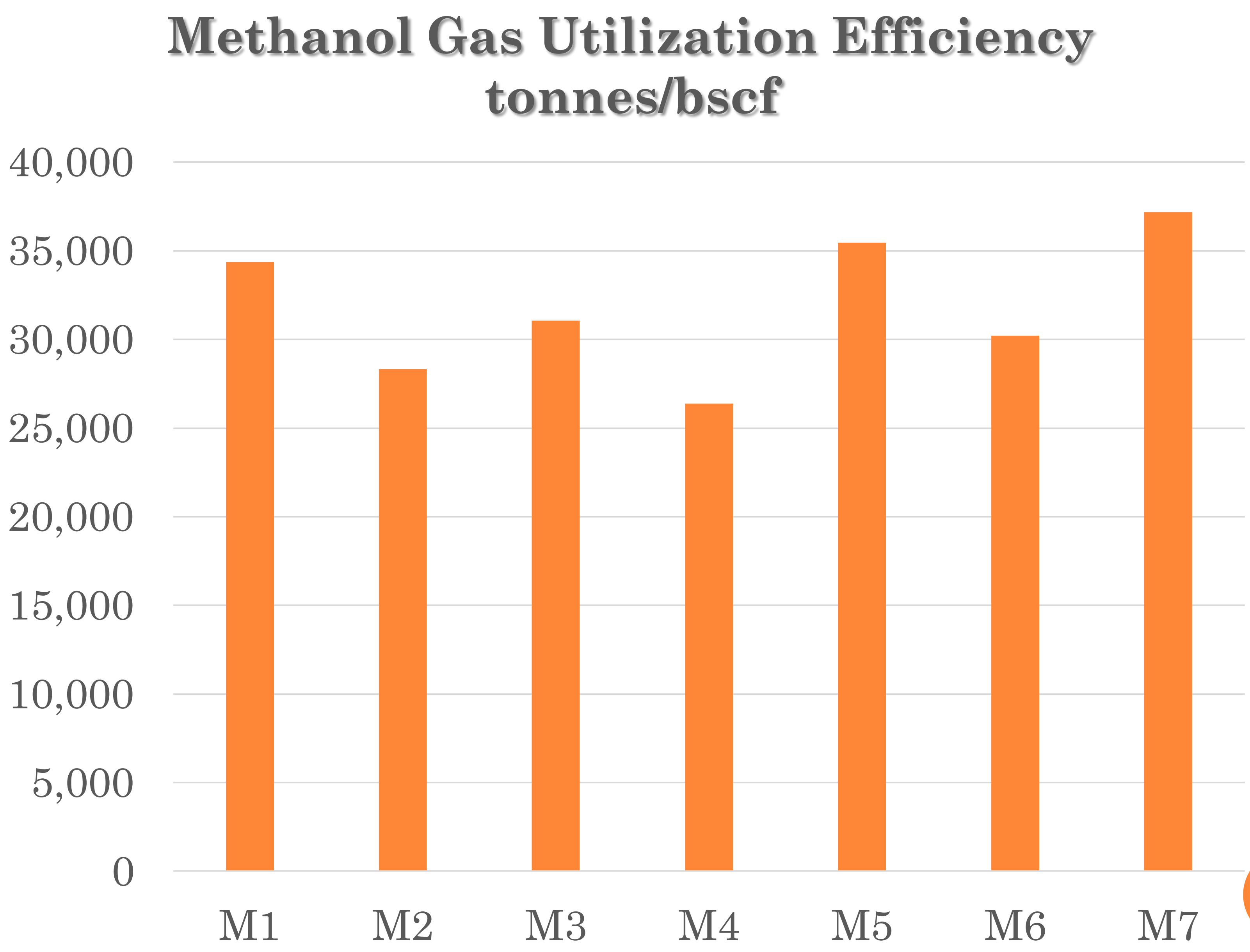
Gas Utilization Efficiency

- Output capacity – tonnes per annum
- Throughput capacity – bscf per annum
- Efficiency - tonnes per bscf

LNG Gas Utilisation Efficiency tonnes/bscf



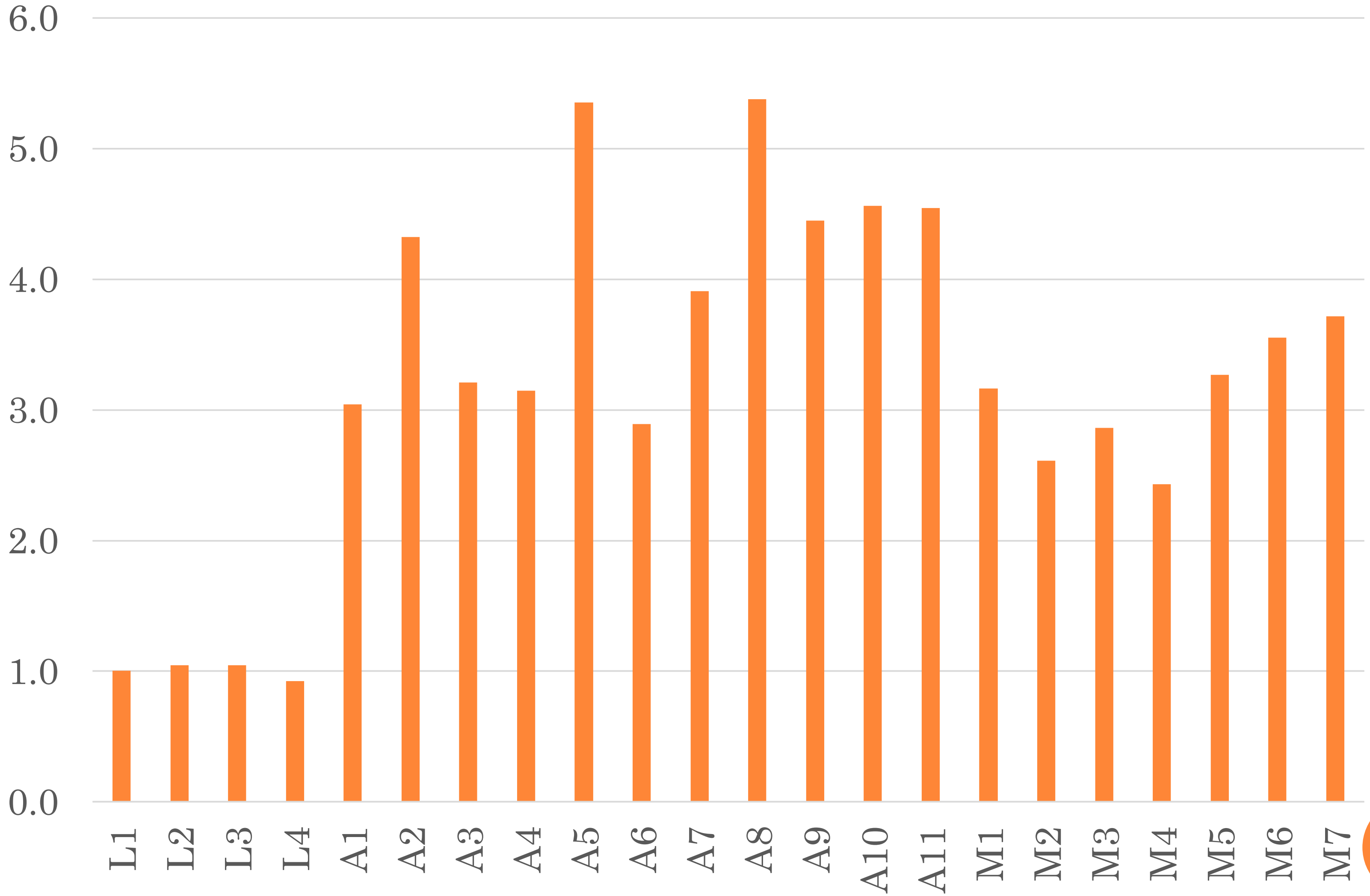

Ammonia Gas Utilization Efficiency
tonnes/bscf
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11


Methanol Gas Utilization Efficiency
tonnes/bscf
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
M1
M2
M3
M4
M5
M6
M7

Employment/Unit of Gas

- Number of employees
- Throughput capacity – bscf per annum
- Employment per bscf

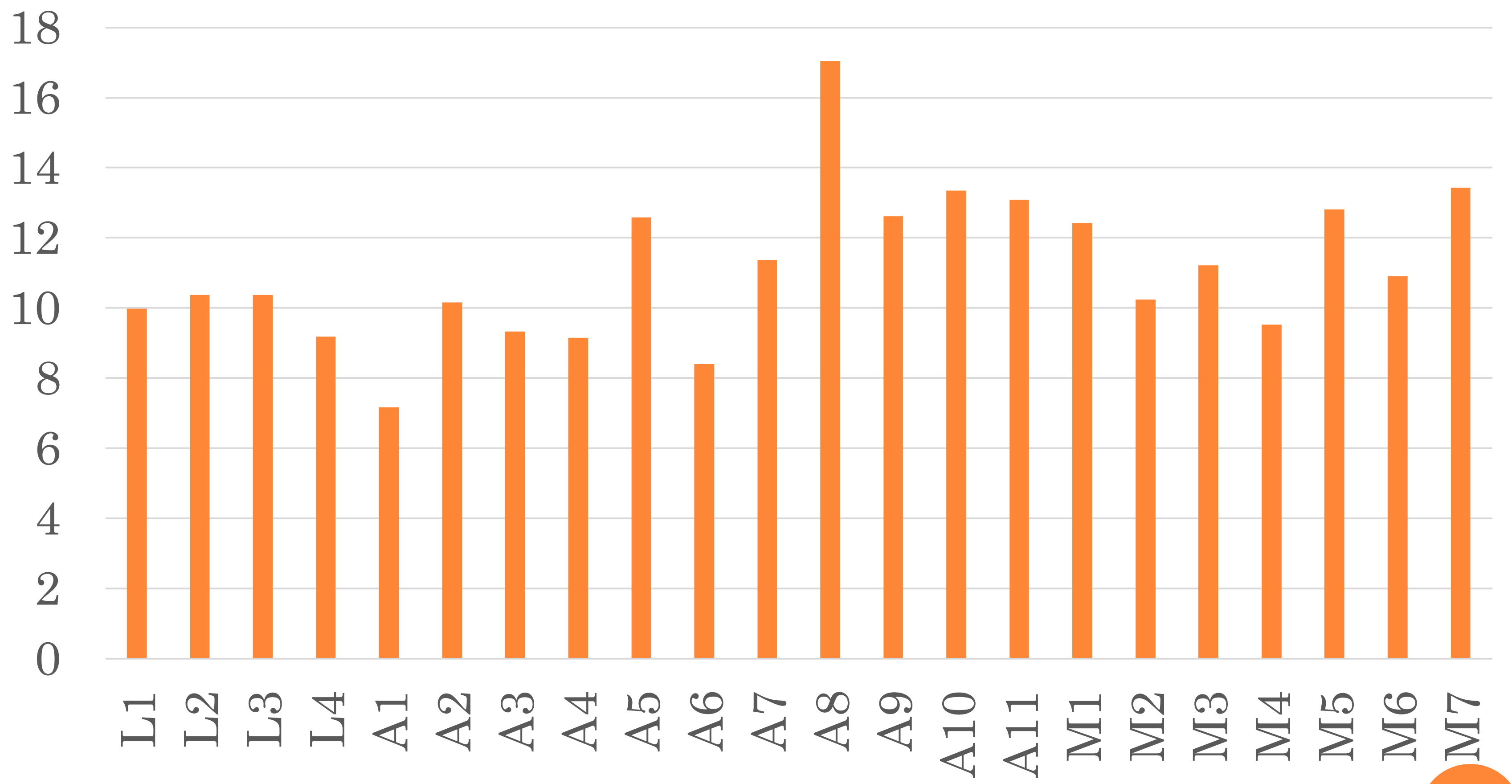
Employment per bscf



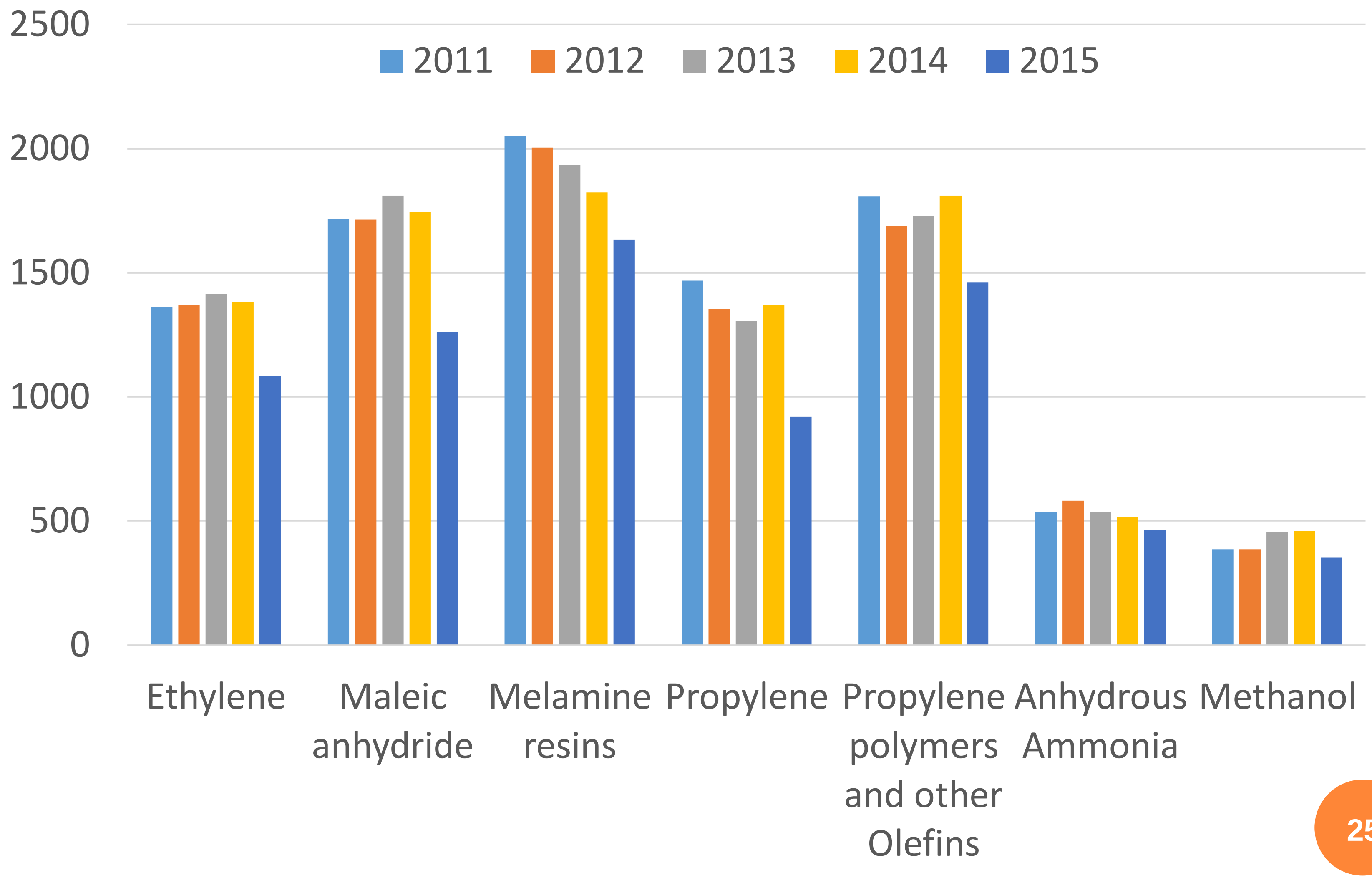
Output value/Unit of Gas

- Value of output – based on average destination price
- Natural gas utilization
- Output value per bscf

Output Value (US$M per bscf)



Price Trends of Natural Gas Derivatives



CONCLUSIONS

- Declining domestic natural gas production
- Evolving international market conditions
- Varying – efficiency, employment and value per unit of resource
- Several projects have been cancelled

Recommendations

- Further downstream – greater value in terms of employment and revenue
- Plant conversion vs new plants
- Opportunities – gas supply contract renewals
- Risks - High price correlations
- Product based natural gas pricing
- Risks – to midstream, and upstream

Thank You!