

# How are today's LNG market dynamics challenging its historic conventions?



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# Introduction

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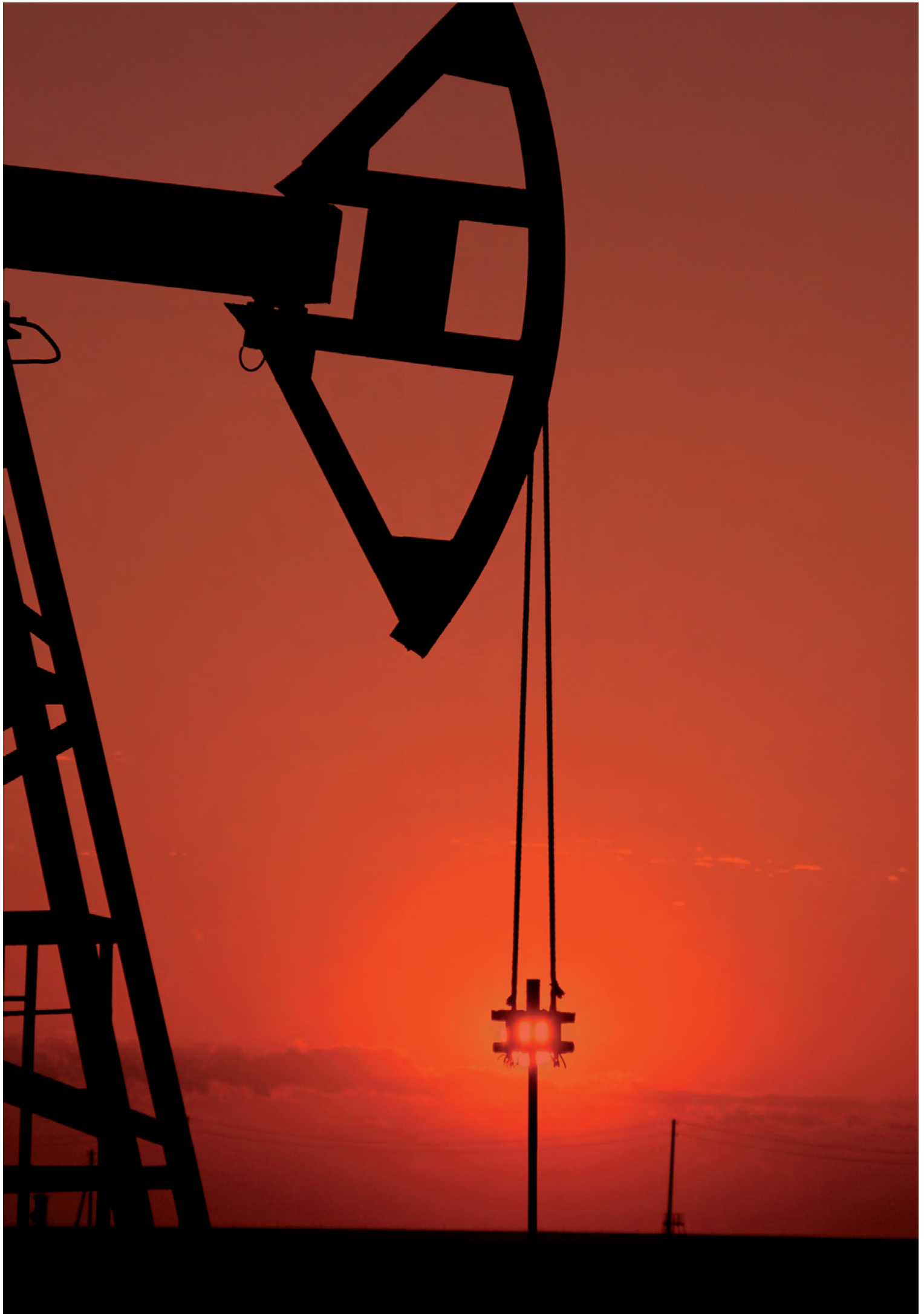
Now, more than ever, stakeholders in Liquefied Natural Gas (LNG) projects need to understand not only market trends in terms of supply and demand, but also the trends that are influencing LNG contracting and prices. This is particularly important for Australian projects, because the Asia–Pacific could emerge as the benchmark region for a global LNG market, with Australia delivering both long-term secure supply as well as valuable ‘swing’ supply to Asian customers.

Global consumption of LNG defied the global financial crisis and a fall in global demand for natural gas by growing more than 8% in 2009, a year of unprecedented growth in liquefaction and regasification capacity.

Australian LNG projects continue to develop at a record pace. Their proximity to the major energy consuming nations in Asia endows a shipping advantage over more distant LNG suppliers and a lower carbon footprint. The unprecedented quantum of new LNG project developments, capital expenditure and new players in the market is transforming LNG from a ‘supplier-to-buyer’ and ‘point-to-point’ long-term contract market to one that is more nimble and able to respond to supply–demand imbalances.

Core to the LNG market are pricing mechanisms that are inconsistent from one region to the next. This begs the question: Is LNG so different from its petroleum brethren that it will not evolve into a market in its own right? Given Australia’s increasing presence in the LNG market, it will play a major role in shaping the direction of these developments. This shaping of the market will bring challenges and opportunities for Australian projects.

This thought leadership paper first addresses the fundamentals playing out in the global LNG market, then investigates complexities and trends around contracting and pricing. The paper considers the implications for Australian projects and their potential to influence the future development of the global LNG market.



# 1. LNG market outlook

## LNG market fundamentals predict supply–demand imbalances. Can Australia play a role as ‘swing’ producer in the Asia–Pacific?

LNG projects are characterised by relatively large capital investments and long development lead times. Abundant sources of gas are ‘stranded’ in regions of low or modest consumption, such as the Middle East, East Africa and the Asia–Pacific. Supply is mostly distant from the major markets of East Asia, Europe and North America (Figure 1). These consumer markets are characterised by strong seasonality, driven by the need for summer cooling and winter heating. One of the key

outcomes of this geographical mismatch between supply and demand has been a relatively high level of gas value differences between supply and demand centres. Value differences for gas between markets are much higher (often exceeding several hundred percent of the commodity value at the domestic supply source market) than in other hydrocarbon markets, such as crude oil (where value differences between regions track in the region 2–5%). The value difference between global gas markets was at its highest when there were only a few LNG suppliers some 10 years ago. However the rapid increase in the number of liquefaction plants and LNG receiving terminals will narrow the LNG market value gap by increasing competition for supply and delivery options.

Figure 1: LNG suppliers and customers, 1Q2010



Global movements of contracted LNG have grown more than three-fold from around 80 Mtpa (million tonnes per annum) to 260 Mtpa in the past 10 years. This has been accompanied by equally dramatic growth in the number of customers and regasification terminals. Global regasification capacity is now in excess of 500 Mtpa, which is nearly double the capacity of just five years ago, according to The International Group of Liquefied Natural Gas Importers (GIIGNL).

Market expansion is one factor that is bringing a moderating influence to the value differences between LNG markets. However, there are other factors, potentially more far-reaching, that are influencing potential value differences between the global gas regions. As the industry matures, advances in technology are facilitating diversification of gas supply sources and more efficient methods of production along the entire supply chain, including:

- **Unconventional gas, such as coal seam methane (CSM)**  
CSM will be an important new source of gas for LNG production when proposed Australian projects are developed. The first is expected to come onstream in 2012.
- **Floating LNG (FLNG)**  
FLNG production vessels can liquefy and store gas and feed LNG into ships directly, with minimal pipeline infrastructure and no onshore facilities. Due to their mobility, they can make economically viable some smaller stranded gas discoveries.
- **Modular liquefaction**  
Modular construction of major liquefaction plant units and supporting components allows less costly LNG liquefaction infrastructure to be developed faster and more efficiently.
- **Onboard regasification**  
Some newer LNG supply vessels can regasify and feed natural gas directly into customers' pipelines, obviating the need for receiving terminals in some situations, and making possible delivery to multiple sites from one vessel.

These trends are lowering capital and operating costs, as well as reinforcing market trends towards greater flexibility and efficiency, and less variability between projects. Although resisted by some of the larger producers that argue that LNG is 'different' due to technical and safety issues associated with trading, the makings of an LNG spot market has emerged in the past few years. The overall trend, in response to technical developments and market dynamics, is towards lower costs and more efficient means of delivering gas from the wellhead and ultimately into the demand centres.

## Looking forward

The immediate outlook for global LNG demand is for supply to exceed demand over the next couple of years. This prediction by energy analyst, EnergyQuest, is based on the substantial liquefaction capacity coming into production in Qatar, together with new projects in Indonesia (Tangguh), Russia (Sakhalin), Yemen, Australia (Pluto), Algeria, Nigeria, Angola and Peru. At the same time, LNG demand from the United States is expected to fall, largely due to the growth in shale gas production.

The additional supply will gradually be absorbed as demand increases with the recovery of the global economy. It is not clear whether this period of slower overall global energy demand growth is temporary or more structural in nature. Uncertainty has delayed some LNG project final investment decisions (FIDs), contributing to a projected LNG supply shortfall around 2014.

As with other large energy infrastructure developments, oversupply can be common; rather than a shortage, because capacity is built in anticipation of demand. There is a further surge in supply likely from around the middle of the decade as new projects already in construction or front-end engineering

and design come into production. This may well create a surplus in the global market post 2015.

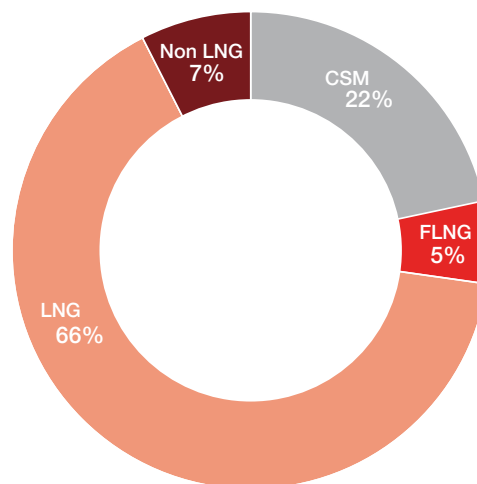
## Looking local

New projects and expansions in Australia and Papua New Guinea (PNG) will be significant contributors to new supply. Capital expenditure in the region is expected to total more than A\$340 billion (including over A\$20 billion for PNG LNG) from now until 2015. Australian investment is dominated by the 'giant' projects competing to supply growing Asian energy requirements. More than 90% of the projected capital expenditure in Australia is directed at export LNG markets rather than domestic gas developments, and FLNG and CSM are emerging as sizeable new market segments (Figure 2).

Figure 2: Australian LNG projects by technology, share of cumulative capital expenditure 2010–15

Note: Non LNG is domestic gas

Source: ABARE list of major minerals and energy projects 2009; The Australian Financial Review; PricewaterhouseCoopers



## Implications for Australian projects

- Australian projects face the immediate challenge of securing contracts for large volumes in an oversupplied market. There will be pressure for more favourable buyer terms as competition to contract supply intensifies.
- Australian projects taking supply to the market in the medium term should be able to take advantage of market opportunities created by a predicted shortfall in supply around 2014.
- CSM projects will be challenged with developing gas resources so that they are available in time for commissioning of LNG plants; they are able to manage any quality differences that impact gas value; and they can meet the competition for LNG supply agreements.

# 2. LNG contracting trends

## Will the global LNG market evolve towards common supply contracting and pricing terms?

Contracted volumes of LNG have increased exponentially over the past 10 years, as LNG production capacity has expanded to meet global demand. At the turn of the century, nearly 2.7 billion tonnes of LNG were sold or committed for sale in 85 contracts. By 31 March 2010, this had more than doubled to nearly 5.8 billion tonnes in 198 contracts (Figure 3).

The rapid upswing from 2002 to 2010 reflects recent rapid market growth for contracted LNG. At the same time, a large number of contracts will be expiring as sources of supply are depleted, with new contracts continually being written to replace them. However, given the significant pipeline of potential new projects and the importance of securing contracts to reach FID and completion, it is surprising that contract volumes fall away as rapidly as they do from around 2018.

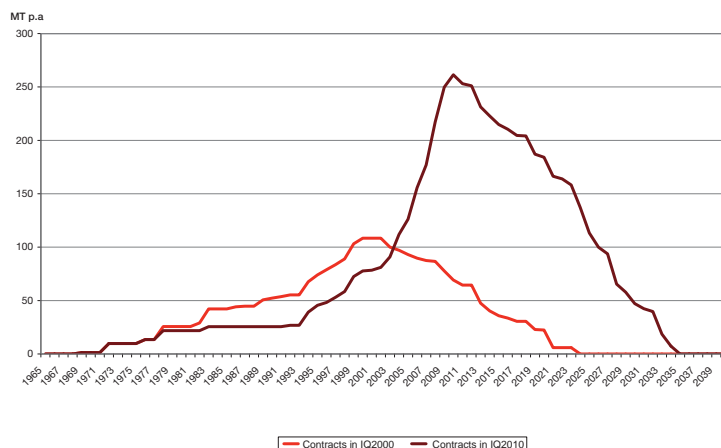
## Shorter term contracts: Are they here to stay?

The market is accommodating shorter term contracts; tenure as low as one year or less (Figure 4). However, these contracts tend to cover smaller volumes (Figure 5). The number and volume of contracts are still dominated by longer term sales arrangements, but the shorter term market is evolving.

As LNG markets mature, producers are more confident in the

Figure 3: Global LNG contract volume by year of delivery, 1Q2000 and 1Q2010

Source: Bloomberg



scope for future contracting, and this may favour shorter term contracts as well as partial contracting (with or without volume swing options). However, projects struggle where too much uncontracted volume exists, making it more difficult to secure project financing. This is less of an issue when the project sponsor has a broader portfolio of LNG supply and can readily manage any mismatch in supply and buyer agreements. These same companies may be reluctant to lock in to long-term supply

Figure 4: Global LNG contract duration by number of contracts, 1Q2000 and 1Q2010

Source: Bloomberg

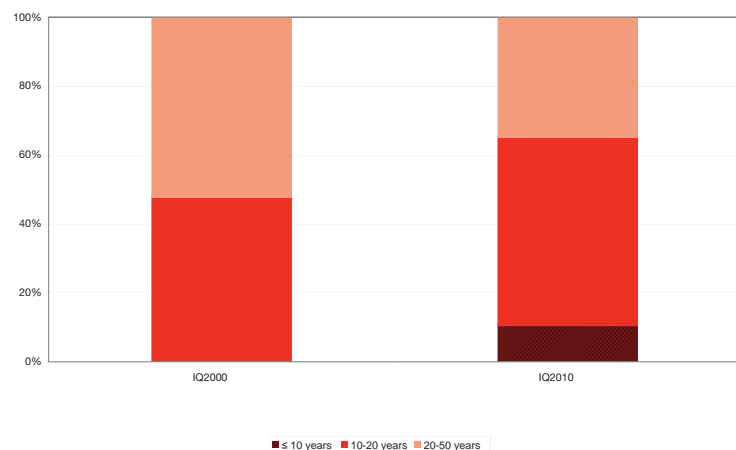
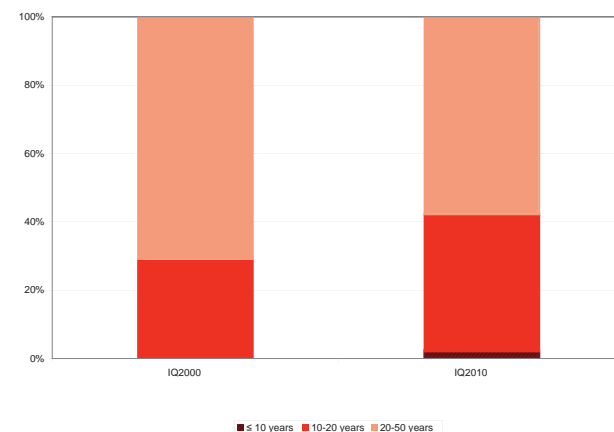


Figure 5: Global LNG contract duration by volume, 1Q2000 and 1Q2010

Source: Bloomberg

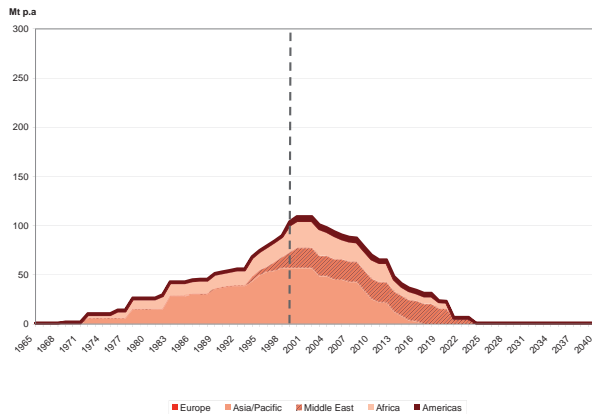


contracts at unfavourable terms if they expect tightening in the LNG market in the future. The increasing relative importance of Atlantic markets (Europe and Americas), where most spot contracts are negotiated, may be another contributing factor (Figure 6).

In 2009, some LNG cargoes destined for Europe were diverted to the Asia-Pacific region, and some major Asian customers took smaller spot LNG supply to take advantage of market conditions. These represent tentative steps towards a global spot market responsive to regional price differences. Some of the reasons behind these price differences are discussed below. More frequent inter-regional trade is also being facilitated by more flexible shipping (eg onboard regasification), and the removal of destination restrictions from some contracts under pressure from customers in a 'buyers' market.

From the supply side, the emergence of the Middle East as a significant exporter has introduced significant new competition for Australian LNG suppliers. (Figures 7 and 8).

Figure 7: Global LNG contract volume by year of delivery and export region, 1Q2000  
Source: Bloomberg



The Middle East has been the most active contracting region for LNG supply in recent times, but Australia dominates the Asia-Pacific region in LNG contracting as other supply arrangements wind down.

As more companies in more locations enter the market on both sides of the negotiating table, more diverse contracting is evolving. In the very early days, the norm was a supply contract for all projected volume to a fixed delivery destination and at a

Figure 6: Global LNG contracts by import region, 1Q2000 and 1Q2010  
Source: Bloomberg

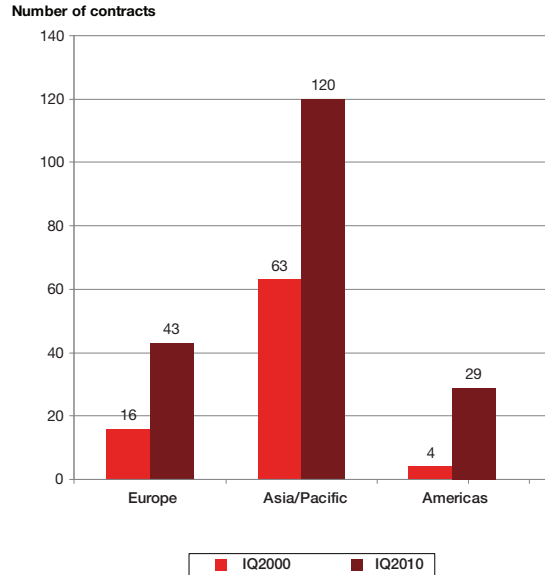
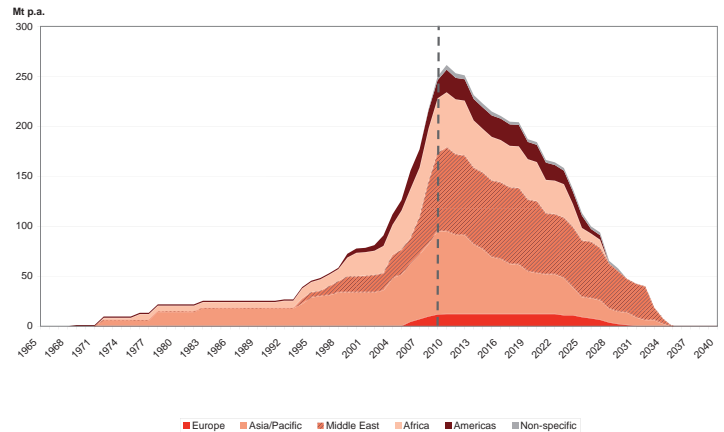


Figure 8: Global LNG contract volume by year of delivery and export region, 1Q2010  
Source: Bloomberg



fixed price, perhaps with a price index escalator (or a pricing band to put limits around price where crude oil indexation was used). Although some of these contracts are still in existence today, more recent contracts tend to include more complex arrangements, such as price averaging to reduce volatility. Price banding and delivery destination restrictions are less common, and terms, such as options on additional cargoes, are more common.

## East and west gas prices: Will they converge?

Prices in most LNG contracts are linked to an energy index. Crude oil indexes were used initially because oil was a mature market that facilitated ease of benchmarking and price risk management. As gas markets have developed, different indexes have been adopted in demand regions with actively traded gas markets (Table 1).

Benchmarking LNG contract prices against these different indexes has resulted in different prices being paid for LNG and, hence, systematic arbitrage spreads between regions. These spreads have widened in recent years.

Although there are no published series for traded LNG spot prices, for the markets where there is direct gas indexation for LNG, it is possible to compare spot prices for natural gas. The difference between those markets can be significant, as reflected in the domestic gas markets in Europe and Canada where the price gap averaged US\$4.50/GJ in 2009.

For regions using oil indexes, it is also possible to estimate the extent of price differences by applying the different indexes to typical contract terms. For example, a typical contract price in the Asia-Pacific region is determined by a formula similar to the following:

**LNG price = (gas/oil parity factor) x JCC + beta + S-curve**

- gas/oil parity factor is usually in the range 0.14–0.18 because gas contains approximately 6–7 times less energy value than oil
- JCC is the Japanese Crude Cocktail index
- beta is simply a pass-through of known transport costs
- S-curves, which place a band around the price with a cap and floor, are becoming a thing of the past as suppliers and customers increasingly manage these risks separate to supply contracts.

The gas/oil parity factor and the index are the main terms for negotiation. If energy value were the only determining factor in the relative prices of gas and oil, then LNG prices based on different indexes would be about the same. However, oil markets are diverging from gas markets, and their relativities are different in different regions (Figure 9).

If oil was priced consistently at parity to gas, these ratios would be the same, at around six times. However, in North America, the ratio has increased in recent years to more than 12 and in the United Kingdom it has oscillated around a factor of 10, implying that oil is priced higher than would be explained by its energy value alone (Figure 10). The indexes used in LNG contracts in different regions have diverged over recent years and are expected to diverge further, based on futures market values.

Figures 9 and 10 do not show actual LNG contracted prices; rather they show equivalent spot market values based on price

Table 1: Price indexes for LNG contracts by demand

Region	Common Indexes	Commodity
East Asia – China, Japan, Korea, Taiwan	JCC (Japan Crude Cocktail)	Crude oil
Continental Europe	Various	Combination of crude oil, oil products and other energy commodities
United States, United Kingdom	NBP (National Balancing Point) Henry Hub	Domestic gas

Figure 9: Crude oil/natural gas price ratio, North America and United Kingdom, 1996–2014

Source: Market prices converted to US\$/mmbtu

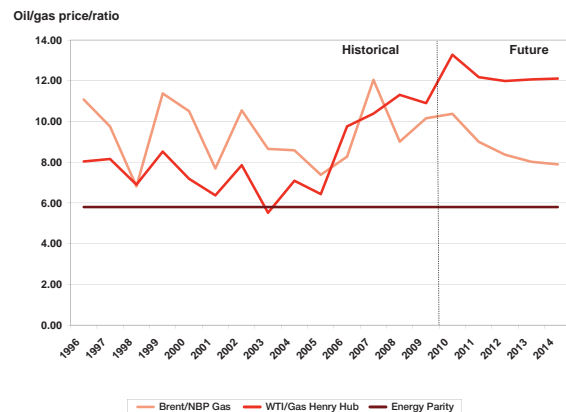
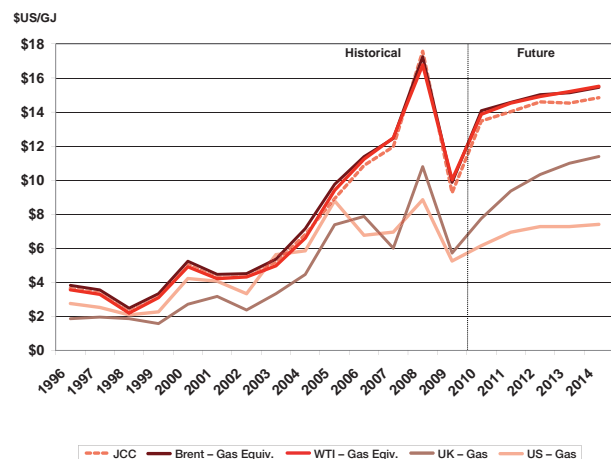


Figure 10: Equivalent spot market values based on price indexes, 1996–2014

Source: Market prices converted to gas equivalent using an oil/gas energy ratio of 6:1



indexes and how these diverge from the anticipated parity energy calorific value. They demonstrate how different indexes can create large differences in the LNG prices actually paid to suppliers.

LNG contracts in the Asia–Pacific region that are price-referenced using crude oil have generally delivered much higher prices than LNG contracts priced on natural gas in the United States and the United Kingdom. LNG contracts priced on a mix of energy commodities would fall somewhere between the two extremes. Even though both sides of the North Atlantic link LNG prices to natural gas price indexes, when the formula is applied to prices from the futures markets, LNG contract prices in the United Kingdom display a higher forward price outlook than in the United States.

Over a period when other sources of energy market arbitrage are diminishing, this systematic LNG arbitrage value stands out. It goes some way to explaining the flow of LNG cargoes from the Atlantic Basin to the Pacific Basin in recent years. It is also leading to pressure from both buyers and sellers to change the way contract prices are indexed. As natural gas markets develop and risk management options improve, crude oil indexes become less relevant. After the extreme volatility in crude oil markets over several years, both buyers and sellers of LNG are looking for greater stability in pricing. If crude oil is sidelined as an acceptable index, the question arises whether worldwide gas markets are sufficiently well developed to provide both a suitable index and risk management opportunities. The other option is to price LNG off LNG!

Some market participants are taking steps to reduce uncertainty further by calling for the development of a standardised LNG contract. Although negotiating power shifts between buyers and sellers depending on whether there is oversupply or a shortage, uncertainty is a challenge for all market participants.

## Is standardisation the future for LNG contracting?

The Association of International Petroleum Negotiators (AIPN), a not-for-profit member organisation of 2200, has as one of its core tasks, the development of ‘model’ contracts. In 2009, it released its AIPN Model LNG Master Sales Agreement (MSA) for spot sales of LNG where transportation is provided by the seller on an ‘ex ship’ basis. The MSA covers the following components:

- contract term
- sale and purchase obligations
- product quantity and delivery tolerances
- pricing terms
- payment and invoicing
- credit support
- taxes, duties and charges
- transportation unloading

- measurement and testing
- force majeure
- dispute resolution.

These components demonstrate the complexity of LNG contracts, which also reflect physical parameters, such as product quality and the customers’ specific delivery needs.

Nevertheless, the AIPN created the model MSA to facilitate the creation of a more efficient LNG secondary market, and encourage trading and arbitrage of LNG cargoes (see [www.aipn.org](http://www.aipn.org)). Although the LNG spot market is very much in its infancy, the availability of an accepted standard contract may accelerate its development. As the market matures, the emergence of a secondary market is a natural part of its evolution. However, despite technological developments towards greater flexibility, LNG production, distribution and consumption remain technically challenging relative to other energy sources, such as crude oil. Therefore, there may be a limit to the extent to which LNG can be freely traded on spot terms.

## Implications for future LNG pricing

- Australian LNG projects that are indexed to petroleum – mostly delivering into Asia – have been enjoying relatively high prices; but, how long will this last? When capacity comes onstream from 2015, will Asian buyers reject contract prices indexed to crude oil and look for a closer relationship with the Atlantic basin?
- Less than full contracting of LNG plant may compromise finance, which may not be available if all capacity is not committed. The challenge is to strike the best balance of contract terms for the individual project parameters.
- The degree of support for transparency in LNG global pricing through a standardised index is mixed. Support will grow with increasing flexibility in the market and additional facilities and market participants.
- Arbitrage opportunities; flexible delivery terms, greater production and delivery efficiency; and standard form agreements should facilitate the development and potential acceptance of a more liberal LNG market. The question arises whether the LNG market will evolve into a market unto itself or always remain a submarket of other energy markets.
- Consolidation of price indexes used for LNG contracts will only happen if a competitive market is fostered, and support is provided by the industry at large for its development. Surprisingly, an international spot market for LNG could provide further impetus for a single international spot gas market index!
- Will the LNG market of 2020 behave in much the same way as the crude oil market of 2010? Will the Asia–Pacific region provide the benchmarks for indexes? Is this an opportunity for Australian LNG stakeholders to play a leading role in the global LNG market, delivering both secure long-term contracted supply and spot volumes on demand?

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# About our author

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Brian specialises in Energy & Utilities advisory where he consults clients on strategy & business development, market risk and the management of energy trading risks, and specialist corporate and financial advisory. Clients consist of private sector major to small tier oil and gas companies, state owned oil and gas companies, federal and state governments, industry advocacy bodies and various industrial consumers of energy.

Prior to his appointment at PwC he managed the commercial advisory practice at Caminus, a strategy advisor to European energy companies based in the UK. Brian also held positions at Oakvale Capital in Sydney as Divisional Director of Energy Markets, NYMEX as Director of Energy Research, the Royalty Management Division of the US Department of Interior as an analyst and began his career as a petroleum geologist. He holds a Masters degree in Mineral Economics (MSC) from the Colorado School of Mines along with degrees in Petroleum Geology (BSc) Western Colorado and Business Finance (BA) University of Colorado/NYU.

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