

BACKGROUND PAPER

FIFTH ASIAN MINISTERIAL ENERGY ROUNDTABLE

PROMOTING ENERGY SECURITY THROUGH DIALOGUE

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1. KEY DIALOGUE DRIVERS

- Different views and **assumptions related to expected oil demand growth in Asia**, especially in China, India and the Middle East merit on-going discussion, given their importance in scenario building and investment planning on a global scale.
- Future oil and gas **demand levels for transportation**—notably in non-OECD countries including China and India—remain a “known unknown”, or recognised variable, which warrants close monitoring and analysis in the near-term.
- Understanding **oil stocks data from non-OECD countries** such as China, India, and the Mideast Gulf nations is becoming more important for oil markets than understanding OECD stocks data.
- In the advent of a significant upswing in the share of unconventional in the global energy mix, the relevant question is not whether **strategic reserves or spare capacity** will be needed. Instead, the question is how to determine their adequate size, given their costs and impacts on shared global energy security.
- Despite the so-called “**re-regionalisation**” of gas markets, they remain interconnected and interdependent. Developments in regional gas markets have global consequences, as coal to gas switching in the US engendered gas to coal switching in Europe. The energy mix in one region depends on the mix in another.
- More dialogue is required to analyse the merits of proposals to adjust the **structure of gas contracts**. Long-term contracts help ensure security of supply and demand, but for some observers there may be room for these contracts to incorporate more short- to medium-term market signals.
- A scenario in which greater gas trade might cause **regional prices** to converge towards one global price is to an extent a function of future trade volumes in the Pacific Basin, which will in turn depend on the region’s energy policies, its capacity to absorb additional supply, and expected supply levels from Canada, Australia and the US, which will add to streams coming from the Middle East and Africa.
- Despite impressive investment levels and falling costs for some categories of **renewables**, in numerous cases the economics of renewables still do not work *vis à vis* the fossil fuel alternatives.
- It is important that all market actors comprehend the degree to which **renewables require gas** as a back-up fuel.

2. INTRODUCTION

This background paper highlights suggested discussion topics for the consideration of participants in the Fifth Asian Ministerial Energy Roundtable. It summarises briefly current and expected energy market trends relevant to Asia, and connects them with the issues and questions that are drawing attention among market actors and observers, as identified through the activities of the IEF.

The discussion topics are organised along four main headings: energy outlooks, investment and storage, cooperation, and sustainability. The content of each section is not meant to be exhaustive, but instead suggestive of the focus of the global energy conversation.

On the subject of energy outlooks, considerable interest among analysts and policymakers has focused on assumptions about policies and technological advancements used to project energy supply and demand. Prices have not been the main drivers of discussions about the energy future, as they are endogenous or residual to most estimation methodologies.

Considering the expectation that energy demand growth will be practically flat in the OECD, much interest has been paid to demand forecasts for the Middle East and non-OECD Asia Pacific. The rapid rise in consumption from China, India and Saudi Arabia has featured prominently in discussions about the future of demand and what it means for investment and supply. In outlook scenarios where policy provides strong incentives for energy conservation and technological progress in transportation reduces energy consumption, the lowest projected demand and investment requirements are the norm. The converse occurs for business-as-usual scenarios.

Regarding the supply side, the potential impact of unconventional resources on the region's energy mix, together with the shift they imply for direction of trade, has become the subject of closer scrutiny. In the short- to medium-term, greater production of tight oil and shale gas in North America is expected to free up exports from the Middle East to this region and, in turn, redirect them to Asia Pacific. Oil and gas trade from the Gulf countries to East Asia—a feature of interdependence—is therefore expected to increase.

In the medium- to long-term, the technologies that have contributed towards raising output for North America will spread, enabling Asia, most notably China, to expand its oil and gas output. The impact this development will have on trade patterns is difficult to ascertain. Many interactions have yet to play out, but it is reasonable to expect a transformation of long-standing producer-consumer relationships, as the next steps taken by involved market actors will profoundly impact the energy landscape.

In the advent of a significant upswing in the share of unconventional in the global energy mix, the relevant question is not whether strategic reserves or spare capacity will be needed. Instead, the question is how to determine their adequate size, given their costs and impacts on shared global energy security.

An issue related to the expected transformation of energy markets is linked to oil and gas storage. In the advent of a significant upswing in the share of unconventional in the global energy mix, the relevant question is not whether strategic reserves or spare capacity will be needed. Instead, the question that merits discussion is how to determine their adequate size, given their costs and their impacts on shared global energy security.

In nearly all discussion settings participants have highlighted the importance of cooperation to increase market data transparency, which is fundamental for sound policy and investment decisions. Significant progress has been made to increase oil and gas data availability from Asia under the Joint Organisations Data Initiative (JODI) platform, but enhanced cooperation will be needed to expand the database and guarantee its reliability.

None of the scenarios widely discussed portrays energy security for producers and consumers as at risk, at least not under uninterrupted trade flows. Yet dialogue among the Asian sub-regions will

continue to be required to understand energy trends, clarify policy intentions, identify solutions to shared challenges, seize new opportunities, and in general promote collaboration for stable, transparent and sustainable markets.

With regard to sustainability, in recent years world energy markets have experienced major advancements in energy efficiency and the deployment of renewable technologies. Renewable energy sources continue to meet an increasing share of energy demand, and are expected to account for just below 18 per cent of the overall energy mix 25 years hence¹. The introduction of new, more efficient technologies has sparked improvements in energy efficiency in all major energy-intensive industries worldwide.

It is important that all market actors comprehend the degree to which renewables require gas as a back-up fuel.

Many market actors do not fully grasp, however, the extent to which renewables need gas as a back-up fuel. In that regard, the world will actually need every unit of energy possible in the future. Therefore, when discussing sustainability, one should try to avoid a “pro-renewables” versus “anti-renewables” mind-set, and instead embrace a holistic approach to energy matrices.

The sharing of good practices, key learnings, and successful policy approaches between advanced and developing economies likewise represents a realistic avenue for cooperation on the sustainability front.

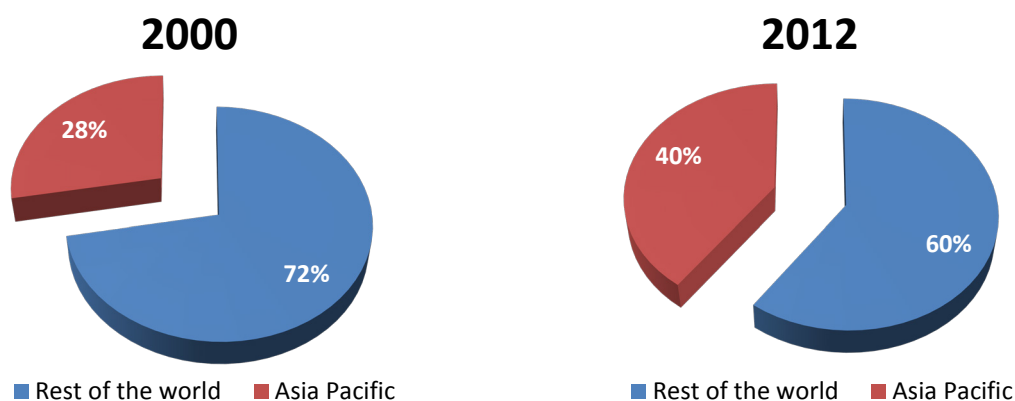
3. ECONOMIC GROWTH AND ENERGY OUTLOOKS

Asia’s rapidly growing economies are expected to remain the primary drivers of increasing global energy demand for the foreseeable future, due to rising per capita incomes, on-going industrialisation, urbanisation, and greater reliance on transportation and motorisation—which will boost Asia’s demand for oil, natural gas, coal, and electricity. In the face of the recent global financial crisis, developing Asia has managed to post solid GDP growth rates, and numerous outlooks and forecasts expect the region to sustain its momentum.

Different views and assumptions related to expected oil demand growth in Asia, especially in China, India and the Middle East merit on-going discussion, given their importance in scenario building and investment planning on a global scale.

As shown below in Figure 1, the Asia Pacific region currently represents approximately 40% of global energy consumption, up from 28% in 2000. Under a relatively conservative scenario, this trend will increase the region’s share in global energy use to 51% by 2035.² Demand in the nations of the Middle East has likewise been on the rise, representing 6.1% in 2012 versus 4.5% in 2000, an increase of more than 81 percent in absolute terms.³

Figure 1: Evolution of Primary Energy Consumption in Asia Pacific⁴



Source: BP Statistical Review of World Energy, June 2013

¹ IEA World Energy Outlook (WEO), New Policies Scenario, 2012.

² Asian Development Outlook 2013: Asia’s Energy Challenge. Asian Development Bank.

³ IEA and BP.

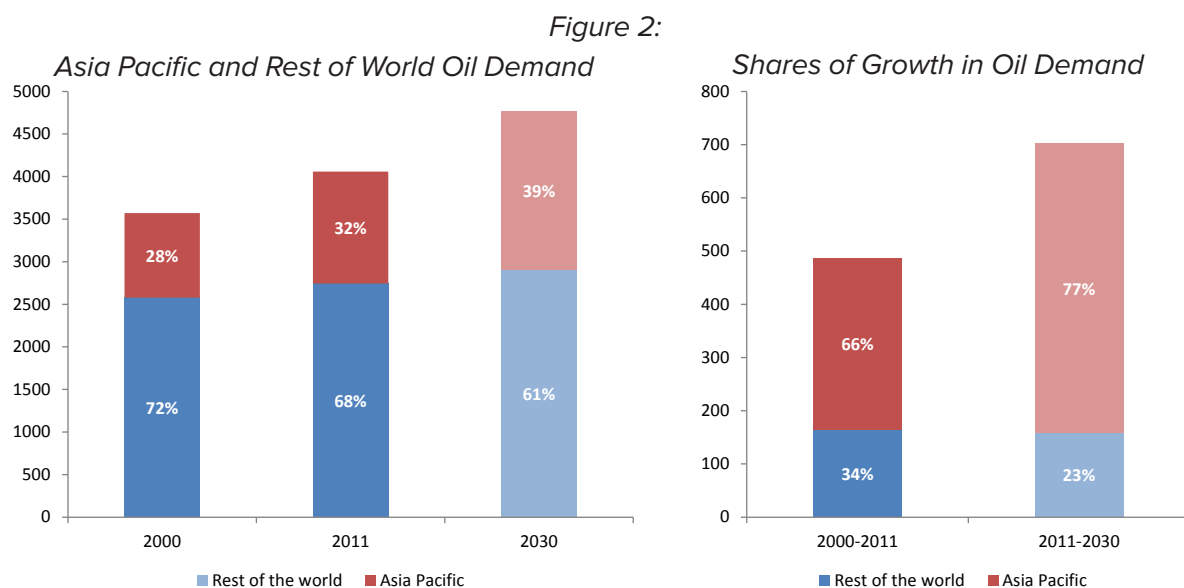
⁴ Asia Pacific in this report includes Australia, Bangladesh, China, China Hong Kong SAR, India, Indonesia, Japan, Korea, Malaysia, New Zealand, Pakistan, Philippines, Singapore, Taiwan, China, Thailand, Vietnam, and other countries with smaller energy demand and supply.

Beyond oil, coal is particularly relevant in East and South Asia, while Central Asia uses relatively more natural gas. For most of the continent's sub-regions, the share of renewables and nuclear energy is relatively small.

3.1. Demand

The Asia Pacific Region has accounted for around 70 per cent of growth in global oil demand over the last ten years. According to virtually all major forecasters,⁵ the Asia Pacific region is likely to account for around 75 per cent of the entire increase in expected oil demand over the next twenty years, with almost all demand growth occurring in developing economies. Much of this growth will continue to be driven by transportation of people and goods.

Future oil and gas demand levels for transportation—notably in non-OECD countries including China and India—remain a “known unknown”, or recognised variable, which warrants close monitoring and analysis in the near-term.



The expected rise in Asia's vehicular fuels demand may represent significant upside for the further expansion of natural gas vehicles in Asia. Last year there were over 17 million natural gas vehicles (NGVs) in operation worldwide, with Iran, Pakistan, India, China and Thailand among the top ten in fleet size.⁶ The pace of future NGV expansion remains an unknown, and more dialogue among the various actors along the NGV supply chain would undoubtedly help deepen the collective understanding regarding the potential and expected future pace of adoption of NGVs.

3.2. Supply and Trade

The Asia Pacific's relative coal abundance contrasts sharply with its limited hydrocarbons resource base. Coal reserves amount to 35% of the world's total, while oil and gas reserves represent 9% and 16% respectively. This dependency on supplies from other regions has quite understandably sparked a rise in its demand for oil and gas imports. Japan and Korea remain 100 per cent dependent on oil imports, India and Southeast Asia import roughly three-fourths of their oil, and China now depends on imports for more than half of its oil needs.

The long-standing producer-consumer relationship between the Middle East and Asia Pacific economies remains strong. The countries and economies of the Asia Pacific import about half of their oil from the Middle East, and around 75% of the Middle East's oil exports, or 20 mb/d, are destined to Asia Pacific.⁷ Last year more than 40 per cent of China's oil imports came from the

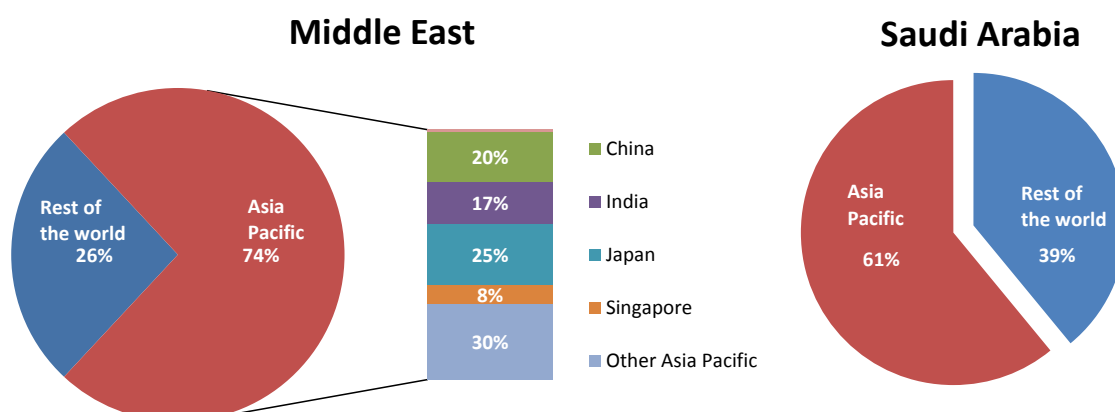
⁵ Notably the IEA's World Energy Outlook (WEO), OPEC's World Oil Outlook (WOO) and BP's Energy Outlook.

⁶ Natural Gas Vehicles Journal.

⁷ BP Statistical Review of World Energy, 2013.

Middle East, with around 20 per cent sourced from Saudi Arabia. India imports over 60 per cent of its oil from the Middle East (around 19 per cent from Saudi Arabia), while Korea and Japan met 70 and 75 per cent of their respective demand through imports from the Middle East.

Figure 3: Middle East and Saudi Arabia Oil Exports by Destination



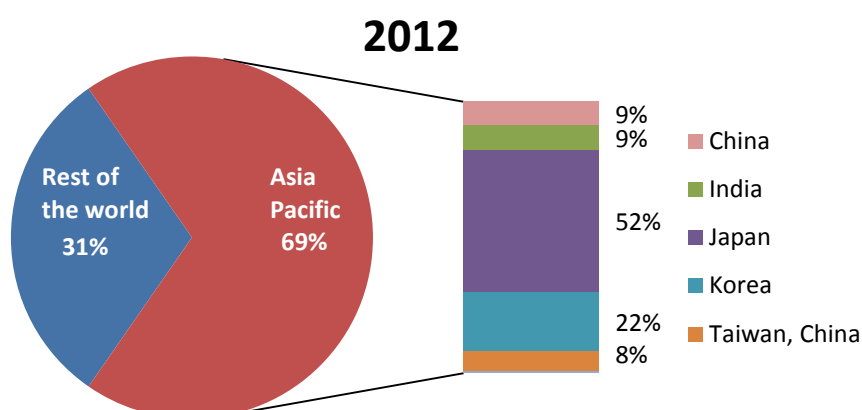
Source: BP Statistical Review of World Energy, June 2013

Looking farther afield, the IEA expects energy trade between the Middle East and Asia Pacific to grow, as North America is forecast to increase production and decrease imports. Some forecasts expect the rise in China's import levels to exceed the forecast drop in US imports, whereby Asia Pacific could absorb as much as 90 per cent of Middle East production. Indeed, the advent of unconventional hydrocarbon resources (such as shale gas, tight oil and heavy oil) and plentiful liquefied natural gas (LNG) has altered the industry's playing field.

Turning to gas, Asia's natural gas consumption has also been rising strongly over the past decade, reflecting rising needs stemming from industrial demand and power generation.

More than half of the increase in global LNG demand between 2002 and 2012, which reached 328 million cubic meters at the end of this period, came from Asia Pacific.⁸ In 2012 Asia Pacific accounted for 69 per cent of global LNG imports (Figure 4). Established markets such as Japan, Korea, and Taiwan, China, accounted for 57 per cent of global imports. Asia Pacific's LNG imports increased by more than 9.5 per cent on the year to 227 billion cubic meters in 2012, of which the three established markets accounted for 82 per cent. According to industry sources, Asia Pacific is expected to account for nearly half the growth in global natural gas demand over the next two decades.

Figure 4: Global LNG Trade, 2012



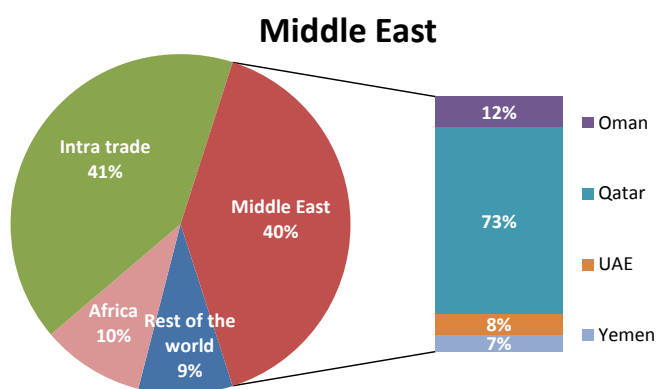
Source: BP Statistical Review of World Energy, June 2013

⁸ BP Statistical Review of World Energy, June 2013.

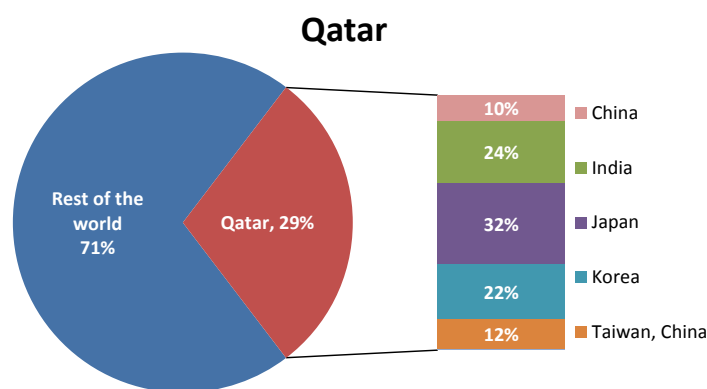
The Asia Pacific's robust economic growth and related demand for energy, notably in the form of LNG, are driving its nations and economies towards greater interdependence with key gas-exporting regions, most importantly the Middle East and Africa. As of last year, the Middle East and Africa provided 40 and 10 per cent of the Asia Pacific's LNG imports, respectively. Qatar is by far the largest LNG exporter to the region: in 2012 it supplied 105.4 billion cubic meters of LNG, representing nearly one third of global LNG supply. Roughly three quarters of the Middle East's LNG exports to Asia Pacific come from Qatar (Figure 5).

Figure 5:

LNG Exports from the Middle East 2012



Qatar's Contribution to Asia Pacific LNG Imports in 2012



Source: BP Statistical Review of World Energy, June 2013

According to the IEA, there is a growing concern about LNG supply availability through 2015, after which time new projects in the region, mainly from Australia, are expected to boost supply levels.⁹ The full impact of possible new supply remains unclear and warrants greater dialogue, as it may well alter the competitive landscape. In the short-term, a tight LNG market is expected to sustain competition with coal in Asia Pacific, where alternative gas import sources and domestic production are limited.

4. OIL AND GAS STORAGE, COOPERATION AND INVESTMENT

4.1. The Importance of Oil Stocks Data

Oil stocks data represent an important component of any supply and demand balance analysis. The stocks themselves play an essential role in keeping the global supply system operational and well supplied. Stocks are considered “shock absorbers” for global oil markets, providing a cushion for breaking geopolitical developments, severe weather and other exogenous events.

For some time, OECD stocks and their forward demand covers have been important drivers of market psychology, and explicit indicators used by many market actors to assess the health of the global supply-demand balance. Yet given recent shifts in regional energy trends, understanding stocks levels in China, India, the Mideast Gulf and other non-OECD countries is becoming more important for oil markets than assessing OECD stocks data. Despite their rising importance, non-OECD stocks data are not always easy to obtain, and there is room for improvement regarding their availability, visibility and reliability.

The growing importance of non-OECD inventories and the impact they may have on the global oil market merit additional dialogue and analysis. For example, while there are numerous initiatives to build strategic petroleum reserves in emerging and other major, non-OECD oil consuming countries (such as China, India, Indonesia, Laos, Myanmar, the Philippines, Thailand and Vietnam),

⁹ Medium-Term Gas Market Report, IEA

reserve targets and demand outlooks remain unclear. Shared knowledge of strategic petroleum reserves is beneficial to overall oil market stability. More complete, reliable and timely non-OECD stocks data featured in JODI, both on levels and changes, would improve the collective understanding of global oil market balances, improve analyses of short-term oil market behaviour, and might help to reduce uncertainty over demand outside the OECD nations.¹⁰

Another point that merits additional scrutiny is the notion that increasing oil demand in developing countries will not necessarily lead to the creation of stock levels similar to those in OECD countries, given the combination of low initial capacity, longer transit distances, and strong non-OECD demand growth versus declining demand in the OECD. While the average non-OECD forward days of coverage may not reach typical OECD levels, total stock levels might, especially when accounting for additional oil-at-sea.

Given their importance, stock levels of both crude oil and refined products often determine the direction of the market. Policymakers may want to monitor price movements of refined products, notably diesel and gasoline, as bottlenecks related to products can spark price fluctuations—and because citizens of their countries tend to focus more on the price of motor fuels than on crude prices.¹¹

4.2. Cooperation and Data Sharing: Focus on Gas

As international trade in gas, particularly LNG, continues to rise, more data on global gas supply, demand, trade and stock levels would improve both transparency and efficiency on a global scale, and naturally in Asia Pacific and the Middle East. More accurate and timely gas data would help market actors make more informed decisions over both the short-term and long-term, in a number of ways, as illustrated below:¹²

Short-Term	Long-Term
Annual Budgeting	Strategic Planning
Purchasing Decisions for Power	Upstream Investment Decisions
Generation	LNG Fleet Decisions
Conducting Short-Term Market Analysis	Structuring Long-term Contracts

The IEF and the JODI Partners launched a beta version of JODI-Gas in January 2012, which features monthly data on production, consumption, LNG, stocks and trade. Access to JODI-Gas is currently available for countries and economies that are submitting data and to the JODI Partner organisations, though JODI-Gas will be launched to the public by the end of 2013 (or as soon as feasible thereafter).

As the data featured in JODI-Gas are supplied by the participating countries on monthly basis, JODI's ability to contribute towards greater transparency and to help market actors make more informed decisions is a direct function of the commitment level of all participating countries and economies.

¹⁰ This issue drew considerable attention at the Third IEA-IEF-OPEC Symposium on Energy Outlooks (Riyadh, January 2013).

¹¹ At the IEF Thought-Leaders Roundtable on Price Formation (Vienna, March 2013), participants analysed the dramatic rise in the price of crude in 2008, and identified one of the causes as a shortage of refined products.

¹² These areas were identified among the interests of current and prospective consumers and producers of natural gas in Asia, as well as LNG exporters, in access to wider and timely information about gas flows and LNG capacities worldwide, at both the Second and Third Gas Data Transparency Conferences, organised by the IEF, JODI Partners and the host governments Qatar and Indonesia (Doha, May 2012 and Bali, June 2013, respectively).

4.3. Investment and Dialogue

Fulfilling growing energy demand needs from Asia, and more broadly the world, will require massive investment from producers and consumers alike. According to the IEA, between 2011 and 2035 the world's energy supply infrastructure will require a cumulative investment of around US\$38 trillion, with oil and gas accounting for US\$20 trillion (fuelled in part by a rising need for upstream investment and higher costs). Investments through 2035 in Asia Pacific (including Oceania) and the Middle East are estimated to be US\$12.3 trillion and US\$2.2 trillion respectively, together representing almost 40 per cent of expected global investment.

Under-investment or delayed investment could generate shortfalls in the incremental capacity required to meet expected future energy demand, which would result in price hikes. Conversely, "over-investing" may well lead to over-capacity and idle resources. Achieving the optimal investment level is dependent on, among other factors, a frank and open dialogue among both producers and consumers. Enhanced communication and cooperation between them could help to mitigate some of the questions and doubts in the investment climate. Previous experience has shown that uncertainties and challenges related to investment are better addressed when industry stakeholders are cooperating and communicating openly on topics such as costs, knowledge, risks and benefits.

One of the related findings from the Third IEF-IGU Ministerial was that when faced with multi-billion dollar investment scenarios, gas companies weigh their decisions heavily on the degree to which the "rules of the game" in the target jurisdiction are expected to remain stable. Accordingly, policymakers are faced with the challenge of balancing the short-term nature of their mandates with the long-term goals of the nations they represent.

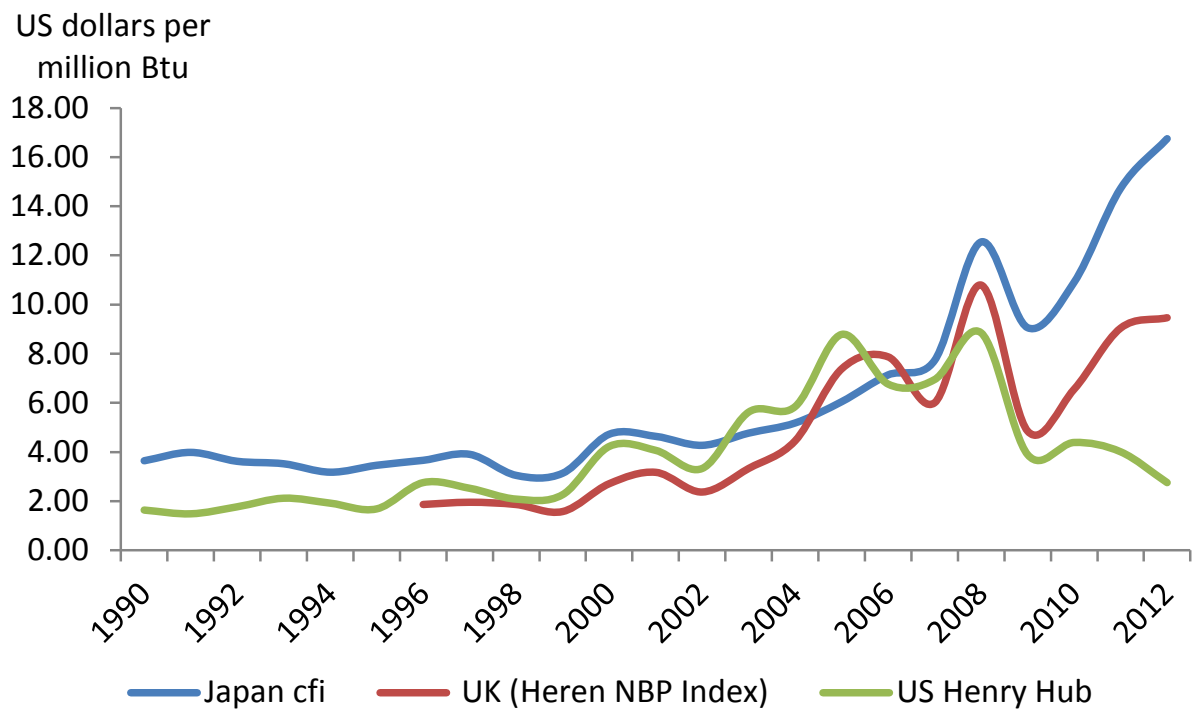
4.4. Gas Pricing Mechanisms

Despite increased LNG trade levels, regional gas markets remain disconnected and are characterised by significant variations in market structures and pricing mechanisms. The rapid rise of shale gas in North America has slowed or reversed the perceived shift towards globalisation and price convergence, as access to unconventional oil and gas resources has driven down production costs. The gas glut has sparked lower prices in the region and underscored the fact that the US market is disconnected from other regional markets.

European gas prices meanwhile continue to be influenced by oil price movements, albeit with a weaker correlation as a result of increased volumes traded on the spot markets and the introduction of spot indexation in some long-term oil-indexed contracts. Spot indexation components in some contracts may be interpreted more as an adapted version of the traditional oil-indexed pricing mechanism than evidence of a transition away from oil-indexed price contracts.

In the Asian market, the price of LNG imports is oil-indexed, and questions surrounding the market outlook and pricing mechanisms for LNG in Asia persist. Are the current pricing and contract mechanisms still applicable, and are they resilient enough to last perceived impending changes to the competitive landscape?

Figure 6: International Gas Price Movements



Source: BP Statistical Review of World Energy, June 2013.

Regarding the oil indexation system of gas pricing, pressures have increased in some quarters to shift towards hub-based pricing, but concern remains about the possibility of price manipulation by either buyers or sellers of gas.¹³ For some, hub-based pricing might prove to be more volatile than traditional oil-linked contract pricing. The capital-intensive nature of gas projects and the long lead-time before payback support the use of long-term contracts, as they have helped to balance risks and rewards between buyers and sellers.

Proponents of market pricing argue that US natural gas prices are market-based, which would eventually give US LNG exports an advantage, as the differential with oil-indexed-priced natural gas can be more than double the US price. Setting aside the necessary changes to US export policies and infrastructure build-out, some experts posit that in light of the shale gas boom, new lower-cost LNG supplies from the US may reach Asia by around 2016. However, to obtain financing US LNG export projects will still need to enter into long-term supply contracts, usually 20 to 30 years, which may be a difficult hurdle to overcome given existing market and financial conditions.

Countering the possible shift in pricing formula, defenders of the status quo maintain that long-term gas contracts linked to oil prices are necessary to ensure the financing of liquefaction facilities, which are usually the most expensive part of the LNG supply chain (which also includes tankers, storage and import terminals).

The global oil market took many years to develop and mature. Gas markets will also have to work through the learning curve of market fundamentals to develop a similar structure over time, so market actors should set realistic expectations regarding the pace of evolution and development of gas markets. Oil-indexation of gas prices has clear merits, but with current oil prices and the sustained economic downturn, some companies have won business by applying a more flexible formula. In North America, the UK and increasingly in Europe, trading at hubs has provided liquid and transparent pricing information. This source of transparency has been slow to spread to

More dialogue is required to analyse the merits of proposals to adjust the structure of gas contracts. Long-term contracts help ensure security of supply and demand, but for some observers there may be room for these contracts to incorporate more short- to medium-term market signals.

¹³ Gas pricing mechanisms were a key topic addressed at the First IEA-IEF-OPEC Symposium on Gas and Coal Market Outlooks (Paris, October 2012).

A scenario in which greater gas trade might cause regional prices to converge towards one global price is to an extent a function of future trade volumes in the Pacific Basin.

Despite the so-called “re-regionalisation” of gas markets, they remain interconnected and interdependent.

the rest of the world. With regard to the possible development of a pricing hub in Asia, hubs generally require a large number of buyers and sellers to function properly. In Asia, the numbers on both sides of the transactions are currently small.¹⁴

Whether or not greater gas trade might cause regional prices to converge towards one global price (adjusted for various costs, including transportation), will in all likelihood depend on future trade volumes in the Pacific Basin. Those future trade volumes will, in turn, depend on the region’s energy policies, on its capacity to absorb additional supply, and on the expected levels of supply coming from Canada, Australia, and the United States. Over the long-term, the current gap in price between oil and gas may not be sustainable, as an abundance of gas may potentially generate incentives for fuel switching in favour of the cheaper alternative.¹⁵

Despite the so-called “re-regionalisation” of gas markets, they remain interconnected and interdependent. Developments in regional gas markets have global consequences, as coal to gas switching in the US engendered gas to coal switching in Europe. The energy mix in one region depends on the energy mix in another. Thus, we should not interpret regional pricing differentials as a sign that markets are not linked.

5. SUSTAINABILITY: ADVANCEMENTS IN RENEWABLES

Policymakers face the challenge of satisfying their nations’ growing appetites for energy while striving to embrace environmentally sustainable policies. Yet there are benefits to the environmentally sustainable path that may make that challenge easier to manage. For producing countries, reducing energy intensity levels and diversifying energy mixes to include renewables can free up valuable energy resources that can be marketed elsewhere. For consuming countries, renewables and efficiency measures can mean more available energy and enhanced energy security as a result. For all countries and economies, choosing an environmentally sustainable path represents an opportunity to contribute towards lower carbon levels. What is more, for some it also means a chance to support the creation of green jobs at home.

In recent years, falling technology costs have made some renewables more competitive, helping to foment both investment and deployment. For example, average wind turbine prices have decreased 29% since 2008, while prices of solar photovoltaics have come down 80% over the same period.¹⁶ In terms of head-to-head competition with fossil fuels, there has also been impressive progress on some fronts. As just one example, a recent analysis of on shore wind power projects in Australia estimates they can be up to 18% and 14% less expensive than new gas and oil plants, respectively.¹⁷

Many countries have on-going or planned investments plans to boost renewables. China stands out as the global leader in clean energy investment, having overtaken the US in 2012 by financing US\$65.1 billion of investments in renewables.¹⁸ Saudi Arabia has ambitious plans to invest over US\$100 billion in renewables in decades to come, with the goal of generating up to one-third of its energy needs through green energy. Australia’s new US\$10 billion Clean Energy Finance Corporation, which will fund renewable energy, energy efficiency and low emissions technologies, has likewise attracted attention. Yet playing a part in renewables finance is not only for governments and large investment funds. Consumers in many countries have become active as well, including in Thailand and Korea where feed-in tariff arrangements have become

¹⁴ Discussed at the IEF Thought-Leaders Roundtable on Gas (Paris, October 2012).

¹⁵ IEF Dialogue Insights report “Insights into Unconventionals in the United States and Beyond”, January 2013.

¹⁶ Ernst and Young Renewable Country Attractiveness Index (May 2013)

¹⁷ Bloomberg New Energy Finance.

¹⁸ Michael Liebreich, Chief Executive, Bloomberg New Energy Finance, April 2013.

increasingly popular.

Despite impressive investment levels and falling costs for some categories of renewables, in numerous cases the economics of renewables still do not work vis à vis the fossil fuel alternatives.

Despite impressive investment levels and falling costs for some categories of renewables, in numerous cases the economics of renewables still do not work *vis à vis* the fossil fuel alternatives. Along those lines, there is no denying the fact that traditional fuels still play a dominant role in most economies. For example, primary energy consumption in the Middle East nearly doubled between 2000 and 2012,¹⁹ with virtually all the consumption met by hydrocarbon production. Yet even with conventional fuels and power sources, there is ample opportunity for the application of environmentally sustainable practices to help make them cleaner and more efficient.

Given the importance of coal in the region and expected rises in demand, coal and related clean technologies merit discussion. IEA figures show that in 2011 China and India represented 46% and 11% of global coal demand, respectively. China has little alternative but to expand its coal use in the power sector in the near-to-medium-term. In addition, the IEA expects coal use through 2035 to rise more than any other fuel (in absolute terms), overtaking oil to capture the largest single share of the global energy mix at nearly 30% of demand.

The adoption and implementation of Clean Coal Technologies (CCTs) quite understandably involve additional related costs, yet CCTs also carry economic and environmental benefits and represent avenues for cooperation among Asian nations and economies. With regard to the upside of embracing CCTs, integrated coal gasification combined cycle power plant technology can significantly increase efficiency levels. In addition, some carbon storage techniques have favourable agricultural industry applications, and captured carbon dioxide can be injected into oil fields to boost recovery rates. On the cooperation front, bankrolling CCT-related costs represents an opportunity for cross-border financing and technology transfer. Japan's proposed emission-reduction credit mechanism is one salient example.

Switching to electric vehicles (EVs), in 2012 global sales of hybrid-electric vehicles (HEV) reached 1.2 million units, representing an increase of over 40% versus 2011. In Asia, Japan stands out as the top market, representing 62% of global sales. Yet other governments in the region have been setting ambitious targets for HEVs and electric vehicles. India is targeting six million HEVs and EVs in its vehicle fleet by 2020, with significant government funding earmarked to support the adoption process. As of last year, over 6% of the world's EVs travelled on China's roads.²⁰ Similar to the case of NGVs, more discussion among numerous stakeholders—from policymakers to regulators to automakers—would help producing and consuming countries alike improve their scenario planning and outlooks development.

Addressing the topic of electricity and sustainability from another angle, the continued rise in electricity demand has sparked an interest among policymakers and market actors in cleaner and more efficient power generation, transmission and distribution. Accordingly, a number of countries, notably Australia, China, India, Japan, Korea, Kuwait, Oman, Qatar and Saudi Arabia have been focusing on adopting smart grid technologies in line with their respective national energy priorities. Smart grid technology holds significant promise for increasing energy efficiency and for integrating renewables into energy matrices. It likewise holds potential for international cooperation, by intelligently linking remote, renewables-rich territories in one jurisdiction with densely-populated cities in another. Realising this potential is no small challenge, as it will involve cross-border or regional cooperation on various fronts, including regulatory and technical. A diversity of power systems, state utilities and national objectives calls for an open and sustained dialogue among all key stakeholders involved.

¹⁹ BP Statistical Review of World Energy, June 2013.

²⁰ IEA publications "Tracking Clean Energy Progress 2013" and "Global EV Outlook" (April 2013)

6. CONCLUSION

A fundamental objective of international energy cooperation is to promote energy security through markets that are stable, transparent, and sustainable. These three characteristics are interrelated and can only be pursued as objectives to the extent that progress is made in understanding their determinants. Market stability is closely linked with adequate investments on both the supply and demand side, sufficient to create necessary buffers for production and consumption to adapt to changing market circumstances. Better data are required to improve investment planning and execution, which have considerable impact over the medium- and long-term behaviour of price signals. Sustainable national energy systems can be built easier in an environment of stability and transparency.

Considering the aforementioned trends and subjects that are currently at the centre of the global energy conversation, the 5th Asian Ministerial Energy Roundtable is an opportunity to discuss, among others, issues and questions like the following:

- If the speed and scale of Asian energy demand growth continues close to the trends observed during the previous decade, what should the appropriate policy responses be to promote orderly markets? What must the aim of international energy cooperation be?
- What are the prospects for Asian energy supply growth, both from indigenous production and imports? How long will it take for the unconventional revolution to reach Asia?
- How likely is natural gas price convergence among regions? Will the expansion of North American output facilitate the energy integration of the Middle East and Asia Pacific?
- What is the appropriate level of strategic reserves or spare capacity in a world of greater oil and gas abundance, assuming the unconventional revolution remains a success beyond North America?
- Are long-term (indexed) oil contracts better than short-term hub (spot) pricing for long-term investment planning? What conditions make either type of contract more attractive?
- What are the main constraints countries face to increasing reporting on stocks? Are they legal, institutional, technical, technological, financial?
- When are fossil fuels and renewables complementary? When are they substitutes?
- What lessons of experience does Asia bring in the promotion of clean energies?