MENASA'S GAS SUPPLY & DEMAND: THE GREATER MIDDLE EAST PARADOX?

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BACKGROUND

The world is full of paradoxes; and few regions are quite as paradoxical as the Middle East, North Africa and South Asia (MENASA). Each subregion has a great deal in common ranging from history, geography, exposure to similar religions and colonization, to rice- the main meal ingredient! Yet their respective hydrocarbon and water endowments are heterogeneous to the point of seeming intentional. Some have plenty of oil and others plenty of gas and some have plenty of both yet elect to import gas and/or liquefied natural gas (LNG). The MENASA energy paradox consists of resource abundance and export opportunities on the one hand, and rising domestic demand and LNG imports on the other. After all, why would the world's 5th largest oil producer ever consider importing gas, let alone LNG?

The energy policies in the MENASA region have surprised the rest of the world. The visions of some of its decision makers are in complete contrast to what would have been expected from a region awash in natural resources. Some, like the State of Qatar, elected to impose a moratorium on gas production- despite sitting on the third largest conventional gas reserve in the world[1]. While others, like the Islamic Republic of Iran, the United Arab Emirates and Oman – all oil exporters- decided to diversify their energy supply mix through nuclear and solar power generation, by importing gas or LNG and in some countries a mixture of all these energy alternatives.

This region is carving its own path. Its creative and innovative response to conventional socioeconomic indicators and macroeconomics will often be misunderstood, but in the meantime its resourcefulness and ability to intrigue and surprise the rest of the world will continue.

AIMS

The paper will discuss the global outlook for both natural gas and LNG and describe MENASA's current and anticipated supply and demand situation. It will show that LNG is an important and growing aspect of MENASA'S energy mix, bringing both security and flexibility, and ultimately, that the so-called paradox is no paradox at all when it comes to LNG.

[1] "BP Statistical Review of World Energy 2011" http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/reports_and_publications/statistical_energy_review_2011/STAGING/local_assets/pdf/natural_gas_section_2011.pdf p. 22

SETTING THE STAGE

Before diving into the core of the subject, let's look at a selection of a few 50 year old front page articles to help the audience prepare itself for a debate and to provoke polemic:

> April 1963: "Natural Gas Field Found in Lush Dutch Meadows....Pipelines would carry gas to the Netherlands' neighbours, France, Belgium and West Germany. Special refrigerated tankers could take gas to Great Britain, which has no natural gas fields" [2]
>
> July 1964: "Energy Revolution Ahead For Europe.....there is every geological indication that the Groningen hydrocarbon reserves extend far beneath the waters of....By the nineteen seventies Western Europe's self-sufficiency in energy should be a practical reality.....;[3]
>
> September 1965: " Crews Strike Natural Gas In North Sea....the chance of finding a trace of oil or gas from a well was 1 in 10 and of finding it in commercial quantities 1 in 50"[4]

A last quote from 2012 for the skeptics who believe things have dramatically changed over the past century and believe we are now better equipped to predict the future:

> "The US Department of Energy has slashed its estimate of recoverable reserves of natural gas in the US to 482 [trillion cubic feet] Tcf, substantially below its 2011 estimate of 827 Tcf" [5]

In short, not much has changed:

1- Predicting the future remains notoriously tricky. Our ability to anticipate supply and demand and as a consequence, the timing and pace of the required profitable investments remains a very challenging task left to a select few who accept both its associated risk and potential economic benefit.
2- Energy powers civilizations and is a major contributor to the stability and the continued prospect for economic and social development. The energy challenge does not carry any flag and remains timeless as its form ranges from electricity to water, to salt to food.
3- Merchants have the privilege and the responsibility to ensure that supply keeps pace with demand and that competition ensures that prices remain within a range that buyers and sellers, consumers and producers can tolerate.

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[2] "Largest Producer In Natural Gas Field Found In Lush Dutch Meadows " Indiana Gazette, April 8, 1963. http://newspaperarchive.com/indiana-evening-gazette/1963-04-08/page-3
[3] The Brownsville Herald, July 1964
[4] Corpus Christi times, July 1964
[5] "US Department of Energy cuts gas reserves estimate" Gas Matters, 24 January 2012

Before we zoom in on MENASA and discuss the trends introduced earlier, let's review the global context for a moment. What are the global natural gas trends that will also influence MENASA?

GLOBAL NATURAL GAS OUTLOOK

First of all, global gas demand is likely to grow by around 2% per year, probably for several decades[6]. By 2030, we expect demand to reach as much as 4.5 trillion cubic metres (tcm) of gas per year, compared with 3.1 tcm today[7]. That is almost a 50% increase! The electricity sector will drive most of this demand growth, as natural gas offers an affordable, fast and cleaner route to meet demand.

A modern gas plant emits only half the CO_2 of a modern coal plant, and 70% less than decades-old steam turbine coal plants, of which there are still hundreds in operation in North America, Europe and China[8]. Many of these older plants are expected to be decommissioned in the next 5-15 years.

In deciding what replaces all that old coal capacity, governments and utilities are beginning to recognise that natural gas capacity is both faster and cheaper to install than other new-build sources of electricity – and much easier to link into intermittent wind or solar electricity than either coal or nuclear.

What about supply? In principle there is a lot of gas around. The International Energy Agency (IEA) estimates that total technically recoverable gas resources worth 250 years of current global production[9]. However, getting this gas out of the ground will require significant investment. According to the IEA, to grow supplies by 40% over the next twenty years, cumulative global investment of some $8 trillion in gas supply infrastructure will be needed[10]- that is more than a quarter of a billion dollar per year.

Along with investment, the industry will have to use an array of innovative production methods to get the gas out of the ground. Over the next decade, technological advances will further accelerate the expansion in unconventional gas production- unconventional have already proved to be a game-changer in North America. These technological innovations will not be limited to North America. By 2020, our industry will be producing from shale gas, coal bed methane, tight gas and sour gas in a host of new locations.

In fact, you only have to look at China to observe the trend in increasing demand and the diversification of gas supplies. As China seeks to diversify its energy supply, the government has thrown its weight behind natural gas. It aims to more than double the share of gas in its

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[6] "Natural gas: a vital part of Europe's energy future" Malcolm Brinded, Executive Director, Upstream International, at the International Oil Summit in Paris, France, 22 April 2010

[7] ibid

[8] "Sustainability Report: Royal Dutch Shell PLC Sustainability Report 2010" http://reports.shell.com/sustainability-report/2010/servicepages/downloads/files/all_shell_sr10.pdf p. 10

[9] "World Energy Outlook 2011" International Energy Agency http://www.iea.org/weo/docs/weo2011/WEO2011_GoldenAgeofGasReport.pdf p. 10

[10] ibid p. 8

primary energy mix to the 8-10% mark by 2020.[11] It is investing in shale gas, LNG regas terminals and contracts, domestic pipelines and supply contracts with Central Asia and Russia. The result will be a more flexible and integrated gas market, allowing China to import more gas.

GLOBAL LNG OUTLOOK

Developments in China are part of a broader story of increasing demand for LNG. Despite the tight LNG short-term market we have today, world-wide LNG demand is likely to continue to grow rapidly. In fact, demand for LNG is increasing at a faster pace than overall natural gas demand, and it could double in this decade.[12] This growth will be driven not only by China, but also by Europe's growing import requirements and a host of countries in Asia that will ramp up or begin importing LNG, including Indonesia, Malaysia, Thailand, Singapore and a few more in South America. Between 2000 and 2010, the number of countries electing to import LNG more than doubled[13] and the number of LNG exporters increased by 50%[14].

Why LNG- which represents less than 5% of the global energy mix? [15] Because LNG is to the energy industry what salt is to the food industry: relatively small but absolutely necessary.

LNG offers unique supply security advantages because of its flexibility. Unlike pipelines, LNG ships can follow demand as it shifts and fluctuates around the world. We saw the value of this flexibility after Fukushima, when Japan ramped up its LNG imports to make up for the shutdown of its nuclear plants. Right now, supplies are growing at a rate of around 6-8% per year, around three times the rate of natural gas overall.[16] The number of LNG exporters is likely to increase by nearly one third by 2015, providing buyers with the comfort of a diversified supply portfolio.[17]

The LNG sector must continue to pursue rapid expansion and innovation to meet demand. Shell for example, is meeting this challenge through its involvement in coal bed methane, shale and tight gas plus with floating LNG. The latter will enable gas liquefaction at sea, which will open up gas resources once considered too remote or expensive to tap. An added advantage is that once production from one gas field has been completed, the 3.5 million tons per annum (mtpa) floating LNG facility can then be re-deployed to another site.

Shell's floating LNG plans for Australia are the most advanced, but we think that there may be opportunities to use the concept in the wider Asia-Pacific region, Latin America, the Mediterranean and West-Africa. So between now and 2030, the global LNG story is one of surging demand, massive investment, tremendous innovation, and rapid globalization.

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[11] "China to double natural gas share of energy basket to 8% by 2015" Singapore (Platts)--21Jun2010 http://www.platts.com/RSSFeedDetailedNews/RSSFeed/HeadlineNews/NaturalGas/8831094

[12] Shell estimate

[13] Outen, Guy- Shell International Executive Vice President for Commercial LNG. Indogas Conference. January 26, 2011

[14] Wood Mackenzie LNG (April 2010)

[15] Wood Mackenzie LNG (April 2010)

[16] Natural gas: a vital part of Europe's energy future" Malcolm Brinded, Executive Director, Upstream International, at the International Oil Summit in Paris, France, 22 April 2010

[17] Wood Mackenzie LNG (April 2010)

On the other hand, some, like Facts Global Energy, expect around 40 mtpa of LNG production from the US to target the premium East of Suez market by 2020[18]. This target is becoming increasingly realistic but perhaps over a longer time-frame as US LNG exporters move closer to FID. Sales have moved quickly with three consecutive LNG customers were signed up end of 2011/early 2012.

Is export from the US a game changer? Possibly; unlike conventional LNG projects, the feed gas for US LNG exports is priced on a commodity basis traded on the Nymex, competing with domestic demand from a wide variety of sources. With the US contributing perhaps 10% of overall LNG demand in 2025, the LNG spot market will remain a function of LNG supply and demand, and not that of domestic US supply/demand, however Henry Hub will continue to have some influence.

It is however worth noting that, (a) US LNG is lean compared to Asian-sourced LNG, correcting for quality will add to the price of LNG sourced from the US, (b) the politics of US energy security as well as other regulatory challenges will play a key role in determining the extent to which US LNG exports will be permitted, (c) current HH prices are lower than the marginal cost of supply hence not sustainable and (d) the dynamics of shipping capacity from US GoM to Asia is complex given the distances involved, the widening of the Panama Canal and potential for LNG carriers to pass will influence these dynamics. All of these interplay to affect the price of US sourced LNG to Tokyo bay, China or the Middle East.

US exports will be a very interesting addition to the LNG family and should, in any event, help respond to the need for additional LNG volumes, but will add yet another ingredient to the dynamics of pricing LNG both to short, medium and longer term sales.

[18] Facts Global Energy website

MENASA AS A GAS AND LNG SUPPLIER

MENASA is a big player in natural gas. This region also includes three of the world's top five conventional gas reserve holders: Qatar, Iran and Saudi Arabia. Its total gas production exceeded 700 billion cubic metres (bcm) in 2010, giving it almost 22% share of the world's gas production, up from around 15% in 2001 according to the BP statistical review[19]. In comparison, the United States, presently the world's top gas producer, produced almost 600 bcm in 2010.[20]

MENASA currently supplies over half of the world's cross-border LNG trade and is expected to deliver over half[21] of the incremental LNG supplies by 2015.[22] Qatar will be driving the growth in supplies.

MENASA is not new to LNG either. In fact, the nascence of the LNG industry was in MENASA, with Shell playing a significant role in the region. In 1964, the world's first commercial natural gas liquefaction plant came on stream in Algeria, using Shell technology. That same year, Shell undertook the management of the first two LNG ships ever built.

Fast forward to the present, Shell is involved in around a third of the global LNG fleet. In Oman, Shell is a partner in Oman LNG (OLNG) since 2000, and through OLNG, is also a partner in Qalhat LNG. In Qatar, Shell has a 30% stake in a joint venture with Qatargas, known as Qatargas 4. Shell recognizes the importance of MENASA in the industry.

Along with the countries mentioned above, Abu Dhabi, Egypt, Libya and Yemen complete MENASA's LNG export picture.

In short, not only was this region the first to produce and export LNG on a commercial scale in Algeria and Libya but it also maintains a very important role in the industry with in excess of 50% of the world LNG supply and collective gas production.[23]

[19] "BP Statistical Review of World Energy 2011" http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/reports_and_publications/statistical_energy_review_2011/STAGING/local_assets/pdf/natural_gas_section_2011.pdf p. 22

[20] ibid p. 22

[21] ibid p. 22

[22] Shell estimate from various sources

[23] "BP Statistical Review of World Energy 2011" http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/reports_and_publications/statistical_energy_review_2011/STAGING/local_assets/pdf/natural_gas_section_2011.pdf p. 22

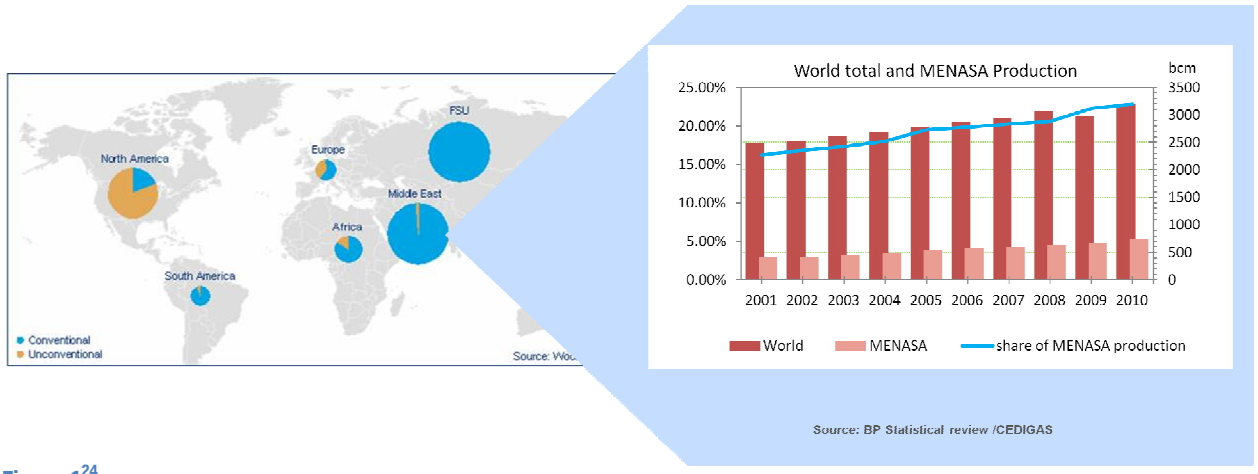

Figure 1[24]

MENASA AS A GAS AND LNG CONSUMER

Now that we have covered MENASA's role as a major source of LNG let's turn to demand. The region's strong economic performance is driving the growth in domestic gas demand. Three factors are contributing to this increase: the switch from oil to gas in the power sector, the growth of the industrial sector, and injection into oil reservoirs to enhance oil recovery (EOR). Consequently, the region's gas consumption is predicted to grow by about 5% per annum, a similar rate to China, and twice as fast as that of the major European economies.[25]

In 2001, MENASA gas consumption barely hit 250 bcm and represented around 13% of the world's share of gas consumption. A decade later, consumption doubled to above 500 bcm and its share of the world gas consumption reached 18%.[26]

India, for instance, has become one of the major gas consumers in the MENA-SA region. Over the last two decades, it has witnessed a tremendous economic growth which needs to be fueled. Natural Gas constitutes 12% of its energy mix.[27] Its gas demand is growing at a rate of 8% pa[28] while domestic production, such as KG-D6, is declining from 22.5 mtpa in 2010 to 6.5mtpa in 2012. A 66% decline from Initial estimates [29]. Consequently, many anticipate that India LNG imports will reach around 20 billion cubic meters by 2020 with an estimated 30 mtpa of regasification capacity and only 9 mtpa supply committed on a long term basis.

[24] Derived from "BP Statistical Review of World Energy 2011"
[25] ibid
[26] Ibid p. 25
[27] Mathur, Rajeev "Natural Gas Industry" GAIL Ltd.
[28] ibid
[29] http://in.reuters.com/article/2012/02/14/reliance-d-idINDEE81D08I20120214

Meanwhile, the annual consumption growth rate of MENASA remained above 5% over the period 2001 and 2010 with years 2008 and 2009 staying substantially above the world average as illustrated in the graphs below.[30]

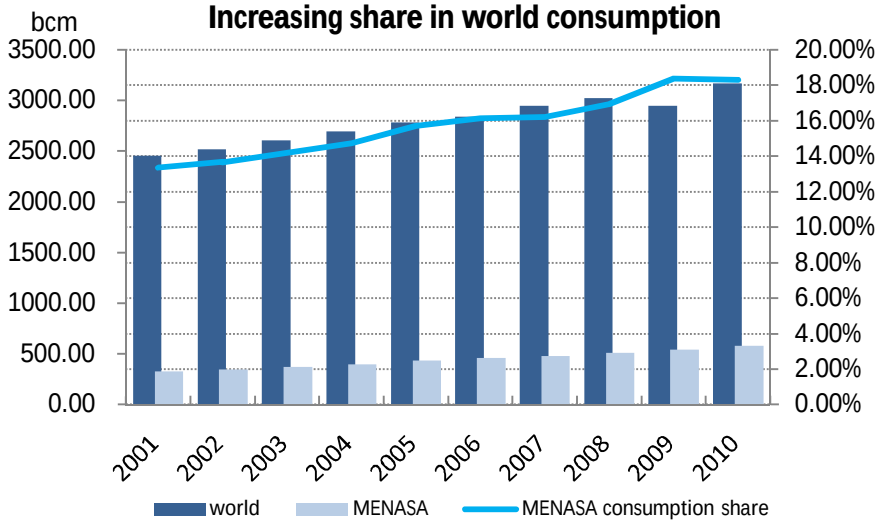

Figure 2[31]

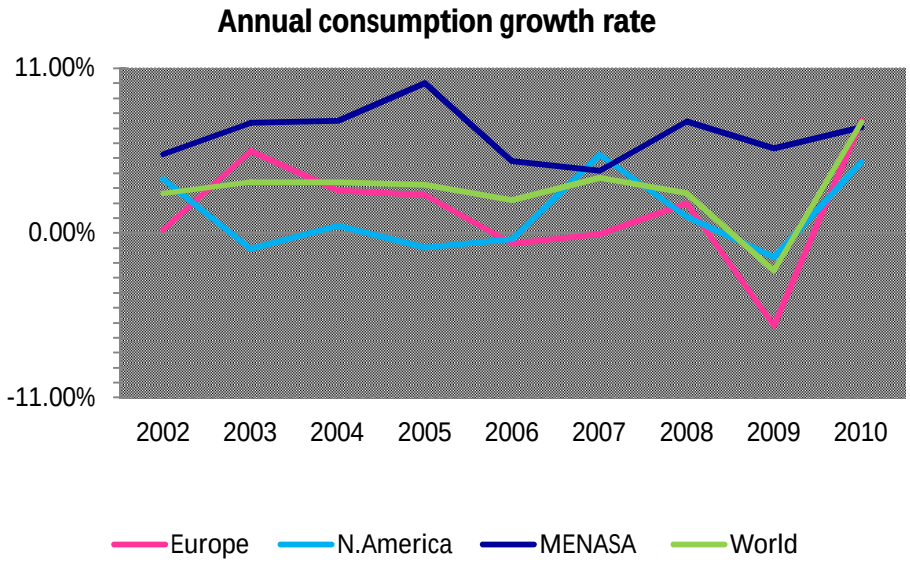

Figure 3[32]

[30] "BP Statistical Review of World Energy 2011" http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/reports_and_publications/statistical_energy_review_2011/STAGING/local_assets/pdf/natural_gas_section_2011.pdf

[31] Derived from "BP Statistical Review of World Energy 2011"

[32] Derived from "BP Statistical Review of World Energy 2011"

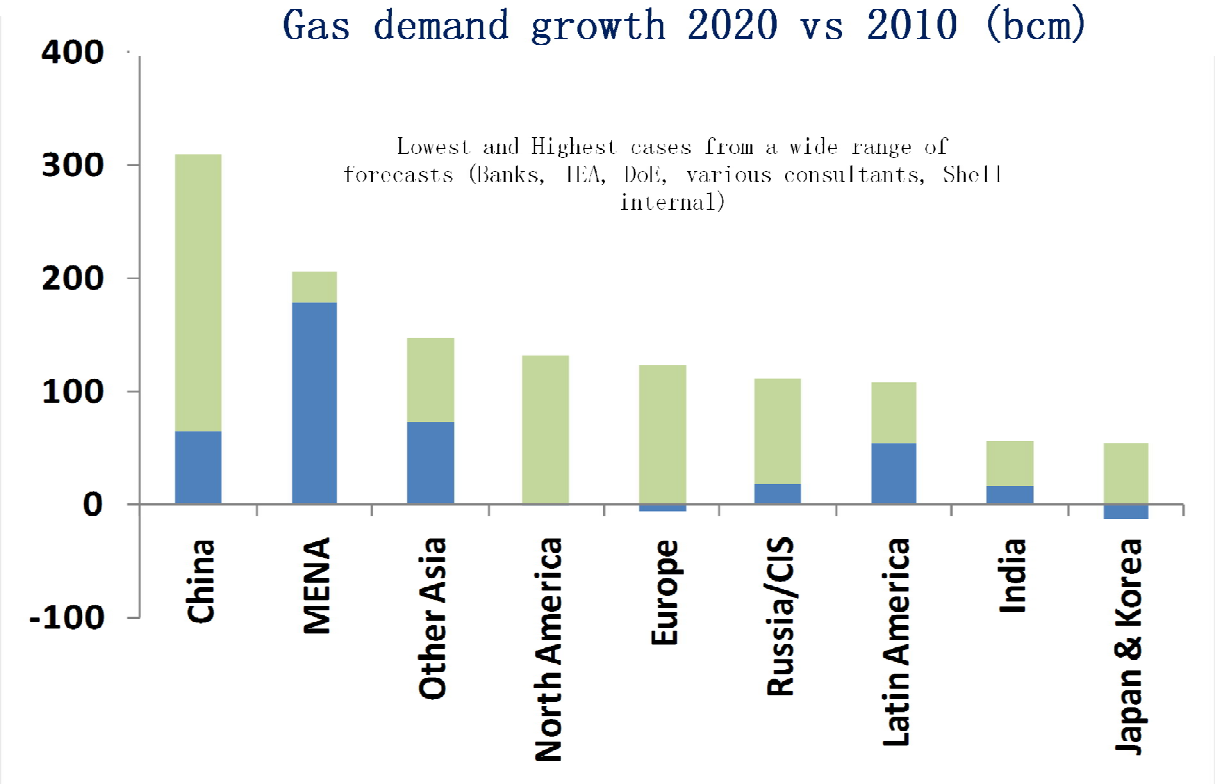

Figure 4[33]

The graphs above show that MENASA demand has grown above world demand and is expected to continue increasing at a considerable pace. The supply/demand fundamentals in the region could lead to an interesting scenario where LNG vessels never sail past the Arabian Sea.

When we compare the world's gas demand with for instance MENA alone (Figure 4), the consensus forecast on the top three is striking, but there is an outlier.

The demand generated by gas reinjection to enable enhanced oil recovery is often ignored in this region. Fesharaki estimates reinjection demand in the Gulf countries increased from 0.17 bcm/d in 2000 to about 0.23 bcm/d in 2008, and will grow to about 0.51 bcm/d by 2020.[34] Iran alone will need over 0.28 bcm/d of gas for reinjection by 2020.[35]

Assuming half of MENASA gas consumption will be for oil production and/or oil substitution, at current oil and gas/LNG price spreads, gas and LNG will at worst compete at oil parity and at best be a multiple of oil if, for instance, we can economically extract ten molecules of oil for one molecule of gas.

Furthermore, between 60 and 80% of reinjected gas can be recovered;[36] so gas reinjection could be seen as a long term storage play.

[33] Multiple sources, Shell analysis
[34] Fesharaki, FACTS Global Energy
[35] ibid
[36] Fesharaki, FACTS Global Energy

Nick Wilson of MEES reported that Iran alone will need 0.56 bcm/d- from the current 0.08 bcm/d- if it is ever to deliver its oil production plans.[37] New entrants and incumbents will compete with Iran for the same supply of LNG. In this scenario MENASA could potentially consume the equivalent of all of its LNG production by 2015. The MENASA paradox has taken another interesting twist.

What is also unique about this region remains most certainly the scale of its people opportunity and the consequence on energy demand. The population growth rates are among the highest in the world and the size of the youth population is of a different scale altogether. In the coming decade, around 60 million people will reach employable age in the Arab world [38] alone and if one adds India, Pakistan and the rest of MENASA, the challenge becomes daunting as the region will need as many new jobs as the population size of the United States.

THE MENASA PARADOX

This brings me to the question of how to solve the Middle East's gas paradox- reconciling resource abundance and export opportunities with increasing local demand. I believe the solution has three crucial elements:

1. Conservation and diversification of energy
2. Increasing natural gas supplies through exploration and development
3. Expanding the region's natural gas and LNG infrastructure (both import and export)

Let us focus on LNG and the role it will play in addressing the supply and demand gap.

LNG provides the world with the lowest technical and non technical transaction costs when compared to other hydrocarbon conventional energy resources[39]. It offers flexibility equal to none, providing customers with price driven supply security. It also remains very efficient to operate compared to coal and is not prone to the high social and environmental costs associated with nuclear failure.

The MENASA region has certainly caught on to the benefits of LNG. As late as Q4 2003, the region had zero LNG regasification capacity available. By Q4 2011 it reached 23 mtpa of operating or near completion capacity and is growing to potentially 30 mtpa by 2014.[40] By 2018, 50 mtpa is possible. It is conceivable that by 2020 MENASA alone will have 70 mtpa of regasification capacity available![41]

The growth in regasification capacity is as impressive as it is perplexing. In a region with abundant gas reserves, why are countries importing LNG instead of building pipelines?

[37] Nick Wilson, reported in MEES in 2010
[38] http://www.un.org/esa/population/meetings/egm-adolescents/roudi.pdf)
[39] Shell estimate
[40] Shell estimate from press articles
[41] Shell estimate from different press articles

Figure 5 below shows the current and future gas infrastructure in the region. A quick glance at the pipeline projects gives you an idea of the political complexity involved in getting these projects off the ground. It can take up to 20 years to develop the simplest cross border pipeline. In contrast, it took Kuwait 20 months to construct a terminal and secure a 5 year 2 mtpa summer supply deal. As you can see, LNG poses an attractive alternative to pipeline gas and other energy sources due to political, cost and time advantages.

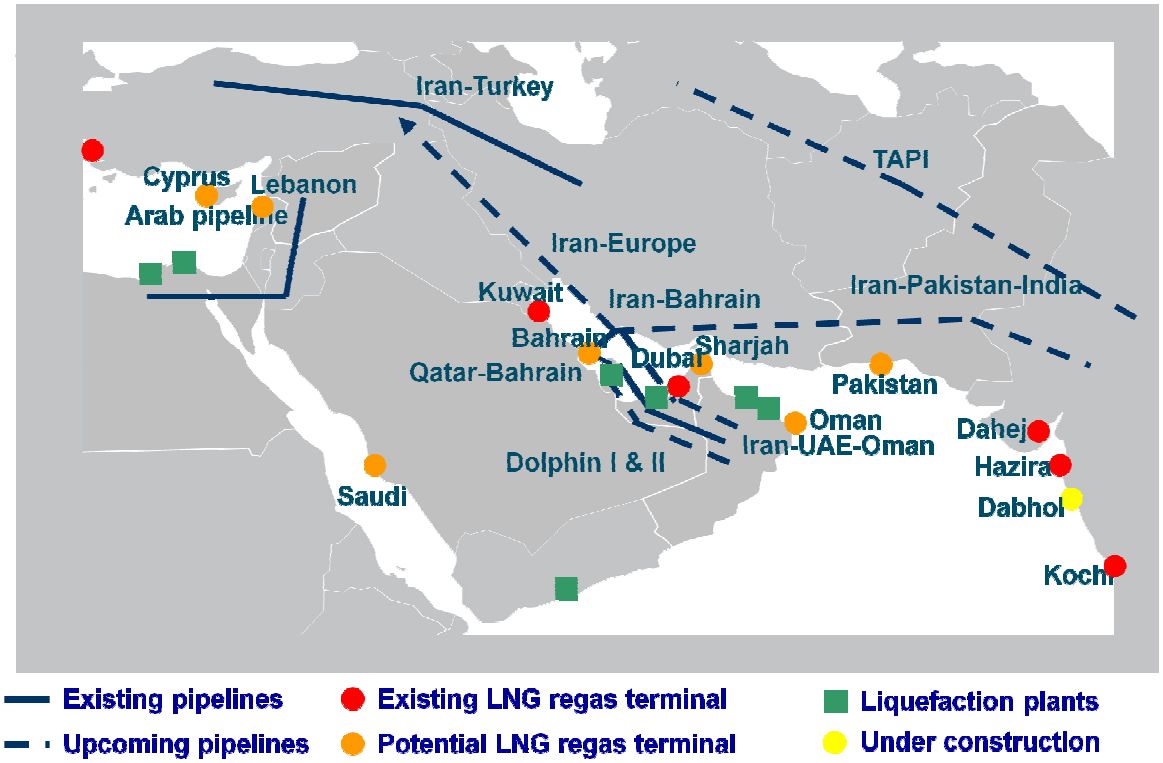

Figure 5 Existing and potential gas infrastructure [42]

CONCLUSIONS

The law of gravity of economics can be summarized in two points:

1- Transaction costs are the cost of (a) searching and discovering what could meet anyone's needs, (b) agreeing with those offering to meet our needs and (c) monitoring that those agreements met those needs.
2- The self modulating forces of supply and demand are collectively represented by (a) short term price volatility, (b) medium term momentum and (c) long term reversion to the mean.

The trends described by the law of gravity of economics can be witnessed in MENASAs relationship with LNG. The amazing increase in LNG growth worldwide and the agility with

[42] FACTS Global Energy

which players and governments switched from import to export (a few times over!) remains fascinating. This is true for the US, for Europe and- as demonstrated in this paper- for MENASA. LNG could represent the lowest transaction costs when compared with the alternatives available today.

Where are we with the paradox? There is no paradox: exporting and importing LNG from the same region and for that matter from the same country can provide major resource holders with an amazing flexibility depending on prevailing oil and LNG price spreads. It also provides buyers with security of supply at a relatively competitive price.

The decisions made in MENASA today are as rational as the decisions of leaders in Europe, Asia and the US 50 years or 3 days ago, simply sound economic decisions. It is all about how to plan the future today with what we think we have, what we think we need and we think we (and for that matter anyone else) may need in the future.

So, as suggested in 1963, let's focus on innovation and on those refrigerated ships the British were contemplating using to import gas from Holland before the North Sea discovery two years later. That might just be the lesson of history.

REFERENCES

1. "BP Statistical Review of World Energy 2011" http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/reports_and_publications/statistical_energy_review_2011/STAGING/local_assets/pdf/natural_gas_section_2011.pdf
2. Fesharaki, FACTS Global Energy
3. Nick Wilson, reporting in MEES in 2010 REPORT??
4. BP Statistical Review of World Energy 2011" http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/reports_and_publications/statistical_energy_review_2011/STAGING/local_assets/pdf/natural_gas_section_2011.pdf
5. Mathur, Rajeev "Natural Gas Industry" GAIL Ltd.
6. Facts Global Energy
7. Largest Producer In Natural Gas Field Found In Lush Dutch Meadows " Indiana Gazette, April 8, 1963. http://newspaperarchive.com/indiana-evening-gazette/1963-04-08/page-3
8. US Department of Energy cuts gas reserves estimate" Gas Matters, 24 January 2012
9. Natural gas: a vital part of Europe's energy future" Malcolm Brinded, Executive Director, Upstream International, at the International Oil Summit in Paris, France, 22 April 2010
10. "Sustainability Report: Royal Dutch Shell PLC Sustainability Report 2010" http://reports.shell.com/sustainability-report/2010/servicepages/downloads/files/all_shell_sr10.pdf
11. "World Energy Outlook 2011" International Energy Agency http://www.iea.org/weo/docs/weo2011/WEO2011_GoldenAgeofGasReport.pdf p. 10