Oil and natural gas prospects: Middle East and North Africa

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HIGHLIGHTS

- Global oil and gas reserves and prices.
- Energy sustainability and the Middle East.
- Energy economics and investments in the Middle East.

ABSTRACT

The MENA region is endowed with enormous resources of oil and gas, rendering it the world’s richest region in this regard. Endowment differs from one country to another with few countries being almost dry; however the economic benefits proliferated to almost every country in the region. In spite of some doubts being cast about the amount of proven oil reserves, these with improved technology and new discoveries are increasing year after another. With no long term feasible alternatives to oil for transport and the increasing trade in LNG, the region’s importance as a world’s leading supplier of fossil fuels will continue for decades to come.

However, these favourable prospects hide many challenges facing the MENA region, among them is the difficulty in mobilizing investment funds for sustaining and increasing output to feed growing global demand. Growing local demand, due to the proliferation of subsidies, is another worrying aspect that already caused few countries with modest resources to become oil importers instead of exporters, with larger exporters decreasing their surplus output. The region is also still mainly dependent on foreign technologies and skilled manpower. Regional cooperation in oil and gas networks and electricity interconnections is still modest.

The region has a long history of conflict; correspondingly it is a major importer of armaments which is increasingly eating a lot of its surplus income. With the political and social changes presently taking place in many MENA countries, due to the Arab spring and continuation of local conflicts, the sustainability of supplies from the region are increasingly a source of worry to MENA exporters and its many importers. It is also causing increasing involvement of the super powers in regional affairs.

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1. Introduction

The Middle East and North Africa (MENA) region has an important role in the global oil and gas agenda. Its oil and natural gas resources are tremendous, so are its problems and challenges. The region is strategically centered between Europe, Asia and Africa. Its geological endowment differs from one country to another, however all countries in the region have benefited from the oil and gas wealth to varying degrees. The challenges are security, national and regional, sustainability and the wise utilization of the oil and gas wealth.

1.1. The oil and gas resources of the Middle East and North Africa

We start by defining the Middle East and North Africa (MENA) region as to include the Arab countries of West Asia and North Africa, as well as Iran. There are no shortage of statistics and information on MENA’s oil and gas resources and confirmed reserves. Often these present varying results due to conflicting interpretations and definitions. The most widely available sources are those of the Oil and Gas Journal (O&GJ) and the BP Statistical Review of World Energy (BP, 2012). In this paper we are mostly interested in the figures of proven reserves; these are discovered volumes having a very high probability of profitable extraction. They need to be distinguished from ultimately recoverable resources which comprise cumulative production, proven reserves, possible reserve growth and undiscovered resources that are likely...
to be ultimately producible. Remaining recoverable resources are the ultimately recoverable resources less cumulative production (WEO, 2012).

The world’s oil proved reserves are equal to 1653 billion barrels of oil (BP, 2012). The O&GJ figures are slightly less and amounted to only 1532 billion barrels at the end of 2011, since these did not include the extra heavy oil in Venezuela’s Orinoco belt of 296.5 billion barrels which were included in BP (2012), thus making Venezuela the world’s leading country for proven reserves. BP also includes Canadian tar sands at 175.2 billion barrels.

The Middle East proven reserves according to BP (2012) were 795 billion barrels, to these must be added the North Africa figure of 65 billion barrels. This makes the total figure of MENA proven reserves equal to 860 billion barrels, which are 52% of global proven oil reserves. If Venezuela’s extra heavy fuel is ignored, then MENA proven oil reserves add up to 56% of the world. This signifies the very important role that MENA plays in the global oil sector and the strategic value of its reserves to the world community. However the accuracy of such oil proven reserve figures have been questioned lately (Jefferson, 2012)

It has to be stressed that the extra heavy fuels of Venezuela, Canadian tar sands and other unconventional oils, cannot be equated on the same basis with the light and medium oil reserves of MENA. The cost of production of these heavy oils is very high, they have a low extraction rate, it takes a lot of energy (natural gas and heating) to extract a barrel of heavy fuels since these heavy fuels have a low energy return on investment (EROI) compared to MENA oils of 30 or higher EROI. Extra-heavy oil needs the addition of diluents (gas condensate, NGLs and light oil) to facilitate their extraction (Salameh, 2012). Therefore in no way can the extra-heavy oils of Venezuela’s Orinoco belt can be equated on the same table with MENA much more valuable reserves. The fact is that taking all factors into consideration Saudi Arabia remains the country with the world’s highest oil reserves that are of value.

The picture changes when we estimate the ultimately technically recoverable resources. In the following Fig. 1, MENA amount to approximately 1200 billion barrels of the global figure of 5800 billion, i.e. only 21%. This may not be the true picture because the unconventional oil resources of MENA have not been fully explored since the attention has till now centered on its easily extractable and cheap to produce conventional oil.

The MENA region is equally endowed with rich proven reserves of natural gas. These, at the end of 2011, amounted to 88 trillion cubic meters (tcm) of total world reserves of 208 trillion, i.e. 42%, mostly concentrated in Iran and Qatar at 16% and 12% of the world’s, respectively. Saudi Arabia’s share of total world’s proven gas reserves is only 4%. The same applies to remaining technically recoverable natural gas resources. The world figure amount to 790 tcm, of which 42% are unconventional. Most MENA’s resources are conventional, see Table 1. The same as in the case of oil, MENA’s unconventional gas recorded resources are limited because interest has been concentrated till now on the abundant easy to produce conventional gas.

It is of great interest to notice the increasing, over time, amount of Middle East proven reserves of oil and gas. Proven oil reserves in 1991 were only around 700 billion barrels, in 2011 these increased by 14% to 795 billion in spite of cumulative production during that period that was 25–30 million barrels per day. The same applies to natural gas. MENA’s proved gas reserves increased from 48 tcm in 1991 to over 88 tcm at end of 2011, i.e. a growth of 83% during these last twenty years pointing out to the increasingly future potential of the region to meet the world’s growing demand for oil and gas. Some of the proven gas reserves are the off-shore recently discovered resources east of the Mediterranean, which are most suited to satisfy the growing gas demand in Europe.

We estimate MENA’s proven oil reserves to amount to 860 billion barrels of oil and another equivalent 581 billion barrels of natural gas. Although the natural gas reserves are still marginally less than that of oil however these are significantly increasing year after another and are expected to equal proven oil reserve in the

### Table 1

Remaining technically recoverable natural gas resources, end 2011 (in trillion cubic meters).

<table>
<thead>
<tr>
<th>Country</th>
<th>Total</th>
<th>Conventional</th>
<th>Unconventional</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. Europe/Eurasia</td>
<td>144</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Middle East</td>
<td>125</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>Asia-pacific</td>
<td>43</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>OECD Americas</td>
<td>47</td>
<td>11</td>
<td>47</td>
</tr>
<tr>
<td>Africa</td>
<td>49</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>Latin America</td>
<td>32</td>
<td>15</td>
<td>33</td>
</tr>
<tr>
<td>OECD Europe</td>
<td>24</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>World</td>
<td>462</td>
<td>81</td>
<td>200</td>
</tr>
</tbody>
</table>

*Fig. 1. Ultimately technically recoverable resources and cumulative production by region. Source: WEO, 2012*
not far future. Therefore the cumulative oil and gas proven reserves of the MENA region amounted to over 1441 billion barrels of oil equivalent, i.e. 48% of proven global reserves.

1.2. MENA oil and gas production and exports

In 2011 MENA produced around 1440 million tons (mt) of oil, i.e. almost 29 million barrels per day (mb/d). In 2012 it is estimated that these production figures went up to 1500 mt.

MENA oil consumption in 2011 was around 480 mt (9.66 mb/d); in 2012 these figures went up to 500 mt thus leaving less than 1000 mt (19.33 mb/d) for exports in 2012. Saudi Arabia has been the world’s largest producer and exporter of oil in the last two years. Growth of oil production in MENA in the last 10 years averaged 11.6% annually, almost in line with the growth of world oil demand during the same period. However, the excessive growth in local oil consumption which went up from around 330 mt in 2001 to 480 mt in 2011 meant that the oil available for exports did not significantly increase in spite of growing production. The growing local consumption of oil is a major threat to MENA’s oil export potential as well as to the world economy and is dealt with in detail in the following section.

In 2011 MENA’s natural gas production was around 670 bcm. In contrast to oil, MENA’s gas production more than doubled over the last ten years. Exports in 2011 were around 221 bcm, of which around 71% was in the form of LNG, the rest by pipeline.

1.3. MENA’s oil demand and gas subsidies

The most worrying aspect in MENA’s oil and gas business is the rapidly rising local oil consumption. MENA’s internal oil consumption went up 330 mt in 2000 to 480 mt in 2011 and approximately to 500 mt in 2012, this is an average growth of almost 4% annually, compared to an average of 1% for the global economy. This, mostly unjustified, local energy growth in MENA is most worrying. It will significantly undermine its long term export potential. It is driven by:

- A booming construction sector.
- Emphasis on expanding heavy industries, mostly energy intensive industries like aluminum smelters, steel and petrochemicals and cement plants.
- The demographic shift in the region towards increasingly a younger and energy hungry population.
- The proliferation of subsidies.

Subsidies lead to misallocation of resources and wasteful use. Oil products in the MENA region are subsidized in every country with few exceptions. Subsidies range from up to 90% of the price in MENA’s OPEC countries to almost no subsidies in the case of some of MENA’s oil importing countries like Jordan, Lebanon and Israel.

In its WEO (2012) report, the International Energy agency (IEA) lists the most oil and gas subsidized sectors in the world. Of these there are 8 MENA countries, all members of OPEC with the exception of Egypt. In 2011 MENA’s energy subsidies amounted to $237 billion as detailed in the following Table 2. Oil subsidies were more than half the energy subsidies, while electricity subsidies amounted to $51 billion, and gas to $40 billion. Of the world’s estimated $522 billion energy subsidies, 45% were spent in the MENA region.

Subsidies are the biggest menace that is besieging the oil and gas sector of MENA. They have transformed some of MENA’s oil exporters, like Egypt and Syria, into importers; other MENA countries, if they continue with these subsidy practices, will be on the same path. Subsidies, as the World Bank and other international development organizations have pointed out; benefit the rich much more than the poor. The requirements of the poor can be served by lifeline tariffs in electricity and smart cards for other requirements. But subsidies have their own political momentum, they are easy to introduce but very difficult to phase out.

Some of the subsidies in the MENA region, particularly in oil exporting countries, have been introduced to assist heavy industries, like aluminum smelters, petrochemicals and cement, which are now flourishing in MENA oil exporting countries. This has enabled OECD countries to rid themselves from these energy thirsty industries, with their severe environmental impacts, and dump them into energy cheap countries, particularly China and MENA’s oil exporting countries. The overall evaluation of the benefits and costs to MENA of such a strategy is beyond the scope of this paper, but one broader environmental point should be highlighted. International agreements on the quantification of greenhouse gas emissions by nations focuses on their production activities, not their consumption. Thus countries which have closed down their heavy industries – such as aluminum smelting and manufacturing – and seen them relocated to the Far and Middle East have claimed that their greenhouse emissions have been moderated and even declined. Yet if the emissions ‘embedded’ in the imports of aluminum (with its close association with the emission of sulphur hexafluoride, which has a far greater Global Warming Potential than carbon dioxide), and many manufactured goods were to be incorporated into the emissions reflected in the consumption of many industrialised countries then a very different picture would be presented.

What can also be stated at this stage is that oil exporting countries are paying heavy costs to meet the requirements of these energy thirsty industries. To ascertain the extent of these subsidies it is enough to mention that in Saudi Arabia crude is being sold to power stations at $4.50 per barrel against a world price of around $110, and gas at $0.75 per million British thermal unit (mbtu). Saudi officials recently warned that if present local energy usage trends continued, domestic consumption may double to 8 million barrels by 2030, severely impacting on its export potential.

Saudi Arabia is now the world’s sixth largest oil consumer. It consumes one quarter of its output. ARAMCO alone consumes 10% of Saudi oil production. MENA oil exporters had a local consumption growth of 56% in the first decade of this century, four times the global rate.

Water is now being increasingly provided by desalination in MENA’s oil exporting countries, and slowly so to other neighbouring countries. MENA is probably the world’s driest region and provision of desalinated water is essential for existence. But this desalinated water, which is also energy intensive, is highly subsidized and correspondingly it is wasted on agricultural products, human and industry consumption leading to overuse and waste. In Saudi Arabia more than half the potable water demand is provided by desalination. Per capita water consumption, due to

<table>
<thead>
<tr>
<th>Country</th>
<th>Oil</th>
<th>Gas</th>
<th>Electricity</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iran</td>
<td>42</td>
<td>22</td>
<td>18</td>
<td>82</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>46</td>
<td>n.a.</td>
<td>16</td>
<td>62</td>
</tr>
<tr>
<td>Egypt</td>
<td>15</td>
<td>4</td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>Iraq</td>
<td>21</td>
<td>n.a.</td>
<td>3</td>
<td>24</td>
</tr>
<tr>
<td>UAE</td>
<td>4</td>
<td>11</td>
<td>7</td>
<td>22</td>
</tr>
<tr>
<td>Algeria</td>
<td>12</td>
<td>n.a.</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>Kuwait</td>
<td>4</td>
<td>2</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Qatar</td>
<td>2</td>
<td>1.5</td>
<td>2.5</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>146</td>
<td>40</td>
<td>51</td>
<td>237</td>
</tr>
</tbody>
</table>
subsidized prices, amount to 235 L daily. This is 91% higher than the global average (Dargain, 2012).

Sometimes the water tariff, if ever collected, amounts to only a few percentage points of the water cost. To control such spiraling costs water is being increasingly rationed in many MENA countries, particularly in the Gulf region.

1.4. Future outlook for MENA’s oil and gas

Global liquids consumption is projected to reach 104 mb/d in 2030 with an annual growth of almost 0.8% (down from 1.4% in 1990–2010). Most of the growth will be in China which is expected to consume 17 mb/d in 2030, surpassing the USA; India’s demand growth over this period (2012–2030) is expected to be 4 mb/d and MENA’s 3.5 mb/d. However, oil’s market share of global energy consumption which peaked at 48% in 1973, dropped to 33% in 2011 and is expected to further fall to 28% in 2030, due to increasing fuel prices (BP, 2030). With the increasing production of tight oil in the Americas (North and South America), the Americas may produce 34 mb/d and equal the MENA in oil production in 2030. Nevertheless, by that year Saudi Arabia is likely to be still the world’s largest oil exporter.

The future economic outlook of MENA is increasingly being affected by the future of oil, demand and prices. Although oil is expected to be the slowest growing fuel in the future, however liquid fuels demand (which includebeside oil, biofuels and other liquids) are expected to rise 16 mb/d by 2030. Of these OPEC supplies are expected to rise by 7.5 mb/d. Most of the increase will come from Iraq 2.8 mb/d and NGIs increasing by 2.5 mb/d. It is not easy to predict future oil prices, but with the increasing cost of producing marginal supplies and nonconventional oils, these prices are unlikely to decrease in real terms over the next few years.

Global natural gas demand growth over the next two decades is expected to average 1.9% annually, this is twice that of oil. MENA will be the biggest contributor to meet this growth with an increased production of 31 (billion cubic foot per day) Bcf/d, mainly to meet its increased demand for power generation and water desalination as well as meeting the demand of its rapidly growing petrochemical industry. It is expected that LNG will contribute an increasing share of the gas trade, and is estimated to grow at a rate of 4.3% annually, meeting 15.5% of global gas demand by 2030. Gradually Africa will compete with MENA in the world’s LNG markets and Australia is soon set to overtake Qatar as the world’s largest supplier. In the world’s markets and outside North America, LNG prices are not expected to decline and most likely will be linked to oil prices.

1.5. The economic and social rewards of MENA’s oil and gas wealth

The economic literature suggests that natural resources (like oil and gas) affect growth patterns in three ways/linkages (Hirschman, 1977): fiscal linkages, production linkages and consumption linkages. In MENA the direct consumption linkages are limited due to the limited local employment in the energy sector and the large reliance on imported goods (UNDP); however it is the income from these natural resources that is fueling consumer consumption. have been able to maximize their rent gains through their direct ownership of the sector and other fiscal regimes.

One of the major considerations in oil and gas economics is the netback of production. Netback is defined as “A summary of all the costs associated with bringing one unit of oil to the marketplace, and all of the revenues from the sale of all the products generated from that same unit. The netback is calculated by taking all of the revenues from the oil, less all costs associated with getting that oil to a market. These costs can include, but are not limited to, importing, transportation, production and refining costs, and royalty fees” (Netback, 2013). The netback of MENA oil is very high because of the very low cost of production and high cost of exports. The average cost of producing a barrel of Iraqi oil can be as low as one to three dollars, while it is exported at over $100 per barrel. The production cost in Saudi Arabia is $3–10 and in the US well over $10. Unconventional oil (like Canadian tar sands) can cost $50 or more. This needs to be compared with the high full cost of producing new oil for the 50 largest publicly traded oil companies in the world which is quoted at $92 a barrel according to Bernstein Research (Bernstein, 2013).

The price of oil is influenced by many factors—the growth of demand which is a product of economic activity, the cost of the alternatives and of producing non conventional oils, the production capacity (particularly spare capacity to meet demand fluctuations) and also the production and pricing policies of OPEC. The MENA oil exporting countries are anxious that the price of oil will always, at least, be able to support their annual budgets. These budgets are set at a certain price of oil, which is usually lower than the market price, and the income and expenditure budgets are based accordingly.

The share of oil and gas in the governmental revenues in oil exporting countries is enormous. In case of Saudi Arabia this amounted to over 90%, in Kuwait to 94% and Iraq to 96%, as is detailed in Table 3 [SPACE] (UNDP). The table shows the almost total dependency of many MENA countries’ budgets on oil and gas revenues to an average of over 70% for the region. The sector’s contribution to MENA GDP was over 35% in 2010, and is increasing. This extractive industries’ sector is the main contributor to the region’s income, while that of the manufacturing sector is very modest, due to the inability of most of the region’s economies to convert their rental wealth to generate sustainable income through industrialisation and self reliance.

In spite of this high income from the extraction industries it has been suggested that real per capita GDP growth in MENA countries, particularly exporting ones, was significantly lower than what would be expected from their mineral wealth (UNDP Fig. 5). Over the past thirty years, MENA non-oil producing countries have done better than oil exporters in achieving a higher per capita income growth. Economic literature attributes this to the “curse

<table>
<thead>
<tr>
<th>Country</th>
<th>GDP ($ million)</th>
<th>O&amp;G ($ millions)</th>
<th>O&amp;G share %</th>
<th>GDP % of Arab %</th>
<th>O&amp;G in gov. revenues %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kuwait</td>
<td>124,244</td>
<td>64,009</td>
<td>51.3</td>
<td>6.1</td>
<td>93.8</td>
</tr>
<tr>
<td>Qatar</td>
<td>128,593</td>
<td>71,642</td>
<td>55.7</td>
<td>6.3</td>
<td>60.8</td>
</tr>
<tr>
<td>Saudi</td>
<td>447,762</td>
<td>214,145</td>
<td>47.8</td>
<td>22.1</td>
<td>90.4</td>
</tr>
<tr>
<td>Arabia</td>
<td>297,648</td>
<td>90,042</td>
<td>31.6</td>
<td>14.7</td>
<td>75.9</td>
</tr>
<tr>
<td>Iraq</td>
<td>121,335</td>
<td>62,643</td>
<td>51.6</td>
<td>6.0</td>
<td>96.3</td>
</tr>
<tr>
<td>Libya</td>
<td>73,965</td>
<td>53,409</td>
<td>72.2</td>
<td>3.6</td>
<td>90.6</td>
</tr>
<tr>
<td>Arab World</td>
<td>2026,735</td>
<td>718,808</td>
<td>35.5</td>
<td>100.0</td>
<td>70.6</td>
</tr>
</tbody>
</table>

Source: UNDP (2012).

2. Income and fiscal benefits

We are mainly concerned here with the fiscal linkages (rent) that the MENA oil and gas exporting countries drive out of the energy sector in different ways. Part of this goes to foreign companies where they are involved (as in Qatar, Egypt, and Yemen). But in most cases MENA’s oil and gas exporting countries

Table 3: The oil and gas sectors’ contribution to GDP and government revenues in Arab countries, 2010.
of natural resources and that there is a significant negative link between natural resources endowment and per capita income growth (UNDP). It is not the intention here to dispute this theory but to point out that, besides the disincentive to development of the existing natural wealth and its rental revenues, MENA income suffered badly due to internal and regional conflicts (Iraq–Iran war 1980s, invasion of Kuwait in 1990 and the invasion of Iraq later), and the disturbances of the Arab Spring that caused considerable damage to oil production and exports as well as infrastructure and development, plans and strategies.

The 2013 budget of Saudi Arabia was announced in early January 2013. It was based on revenue of SR 829 billion ($221 billion), 90% of this is oil sales income. The assumed price of oil for this budget was not announced, but it is believed to be around $66–68 per barrel (MEES, 4th Jan, 2013). With the price of oil over $100 per barrel this means that Saudi Arabia will have a larger income surplus in 2013 than it did in 2012. Similar budget settings are assumed for MENA oil and gas exporting countries. The high level of income of MENA OPEC countries is allowing some of these countries to spend lavishly, sometimes unwisely. The MENA region is the world’s largest importer of armaments compared to its income, with defense expenditure amounting to 8–10% of GDP in most countries, particularly GCC members.

In 2012 MENA countries earned $760 billion from oil exports. This represented 75% of all OPEC revenues. Ten years ago they earned only $150 billion. Saudi Arabia and UAE will need an oil price of at least $80 per barrel to balance their budgets. A decade ago they were able to balance their budgets at a price of $25 per barrel.

Most of the oil and gas production in the Gulf region is undertaken by national companies (NCs). Since the cost of production is very low, most of the income from oil exports goes directly to government coffers. The static reserve to production ratio (R/P ratio) in the MENA region is quite high. Even with increased production the dynamic R/P ratio will continue to be high.

<table>
<thead>
<tr>
<th>Reserves (billion barrels), 2010</th>
<th>Production (‘000 b/d), 2010</th>
<th>Static R/P ratio</th>
<th>Assumed annual compound production growth rate (%)</th>
<th>Dynamic R/P ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kuwait</td>
<td>101.5</td>
<td>2,450.4</td>
<td>110</td>
<td>1.0</td>
</tr>
<tr>
<td>Qatar</td>
<td>24.7</td>
<td>1,437.2</td>
<td>43</td>
<td>4.6</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>264.5</td>
<td>10,521.1</td>
<td>73</td>
<td>1.0</td>
</tr>
<tr>
<td>U.A.E</td>
<td>97.8</td>
<td>2,812.8</td>
<td>93</td>
<td>0.8</td>
</tr>
<tr>
<td>Iran</td>
<td>151.2</td>
<td>4,251.6</td>
<td>95</td>
<td>1.1</td>
</tr>
<tr>
<td>Iraq</td>
<td>115</td>
<td>2,408.5</td>
<td>127</td>
<td>8.7</td>
</tr>
</tbody>
</table>

Source: El-Katiri, 2013.

Future real oil prices are unlikely to drop below 100 per barrels. Therefore fiscal balance in MENA major oil exporters is likely to continue to be healthy” (El-Katiri, 2013).

2.1. Forward linkages (refining, petrochemicals)

Relying on their gas output (ethane, propane and butane); MENA oil and gas producers did rapidly develop a viable petrochemicals sector. This rapidly increased from 4 mt in 1985 to over 157 mt in 2011 (including 42 mt in Iran), i.e. more than 15% of the world’s production, a phenomenal increase. This is expected to reach 20% in 2015, with Saudi Arabia accounting for half of this production at 78 million followed by Iran. Saudi Arabia also accounted for 60% of the region’s exports. A notable development in this regard was the 1982 establishment of the Saudi Arabia Master Gas System (MGS). The key to the success of the petrochemicals’ industry has been the cheap cost of the feedstock. Ethane was made available at a price of $0.75–1.5 per mbtu which gave the Gulf countries a significant advantage over their competitors.

According to BP (2012) the Middle East refining sector amounted to around 8 mb/d in 2011 and with North Africa refining estimated at 1 mb/d the total MENA refining sector is estimated to amount to 9 mb/d. This slightly falls short of MENA’s annual internal oil consumption, meaning that the region is a net small importer of refined products. Some MENA countries, like Lebanon and Jordan, are finding that it is cheaper to import refined products than to develop their own refining industry.

One of the major disincentives to developing the refining sector by national oil companies (NOCs) is the low domestic prices of the refined products. Kuwait is now building the region’s largest refinery. It will cost around $14.5 billion and was first proposed a decade ago. It will process 615,000 bbl of crude oil each day, beating the Middle East’s current largest refinery, the Ras Tanura plant in Saudi Arabia, by 65,000 bbl. Some of the refined fuels will then be used to fuel power plants and water desalination facilities, with any excess being exported.

3. Backward linkages

It is supposed that oil and gas production and wealth can pull forward other sectors (employment and use of local products). These pull effects are called the “backward linkages”.

Unfortunately the oil and gas industry is capital intensive and not manpower extensive. It did provide employment opportunities only for a few locals and did not provide the extensive national and regional employment opportunities hoped for. Therefore the public sector stepped in to provide the required jobs which meant that there was, in MENA, an over employment in the public sector and low productivity.

Also MENA’s oil and gas industry did not incentivize the private sector. The oil industry is highly dependent on advanced and sophisticated products and had to rely on imports. The local private sector has only been able to provide limited and marginal contributions to meet the demand of national oil companies (NOCs).

3.1. Organisational structure in the oil and gas business

In the GCC region the emphasis of the governments is on state ownership of energy utilities. This is due to Dargain (2012):

- The traditionally government ownership of enormous oil and gas sectors since the early 1970s, with limited participation by international energy companies;
- Government provision of below-market value natural gas to various sectors such as petrochemicals and aluminum plants to encourage economic diversification;
- Major revenue inflows from oil and gas sales, meaning that governments generally did not have to worry about expenditures or the efficient use of resources.
- The governments’ desire to redistribute income from oil revenue in the form of cheap or free services, especially electricity and other energy services.

Most energy utilities in the MENA region are the property of the governments which enable them to provide highly subsidized
refined fuels, gas and electricity in a rather very cheap form. This however does not apply to these MENA countries without enough energy resources, some of which encourage the involvement of the private sector such as Tunis, Morocco, Jordan, Israel and Palestine.

4. Human development

Most MENA region countries started their human development efforts in the middle of the last century from a modest base. Over the last few decades there was considerable human development in almost every country in the region. Health standards greatly improved, illiteracy was eradicated in most countries, and university education became common among females as well as males. But in many cases the achievements are quantitative rather than qualitative. The MENA region still depends on the outside world to acquire most of its engineering services and sophisticated technologies. This applies to the oil and gas sector where in spite of its rapid development it was unable to attain a respectful measure of self dependence. Even some of the semi-skilled services are still provided by cheap-Asian labour. The region has not been able yet to create sizable contracting or consulting entities, outside the basic local infrastructure (buildings, roads, basic utility services), to serve adequately its needs. The availability of cheap energy resources encourages rent seeking behaviour and a culture that does not encourage innovation and promote hard work or entrepreneurship. This is a basic challenge in the region, particularly in the oil and gas sector, which still depends on outside skills, services, consultants and services. How to increase self dependence and develop local skills is a major challenge that is still eluding MENA strategists. In Saudi ARAMCO the region has one of the world’s oil company giants; however, the company still depends on foreign labour and skills to the extent of almost three quarters of its staff.

4.1. The oil and gas sector and MENA regional cooperation and development

It must be stressed that the benefits of the region’s oil and gas wealth proliferated into almost every country in the region in many ways—direct assistance, investment and employment opportunities and remittances, as well as trade. MENA’s oil and gas producers established their own development agencies which provided development assistance and cheap loans to needy developing countries but mostly to low income Arab MENA countries. These included national financial funds as well as five major regional funds for developmental assistance, the most notable of which is the Kuwait-based Arab Fund for Economic and Social Development and the Saudi based Islamic Development Bank. Whilst the UN development assistance target is 0.7% of the gross national income (GNI) of the developed countries, these funds were able to more than double that at 1.5% of the combined GNI of the region’s oil and Gas exporters.

There was also a significant increase in inter-regional investment flows. The inter-Arab foreign direct investment (FDI) has grown significantly from $1.4 billion in 1995 to $35.4 billion in 2008, although there has been a recent drop in these funds due to regional turmoil.

The oil wealth of the resource rich countries fueled rapid development in these countries, which necessitated the employment of many Arab nationals from the less endowed countries. Job opportunities were created to millions of Arabs, particularly from Egypt, Syrian and Jordan in MENA’s oil exporting countries. Without these job opportunities many non-oil exporting MENA countries will be in financial trouble with larger unemployment. With these employment opportunities came also remittances which greatly improved the gross national income of the labour exporting countries.

5. Regional energy networks

MENA’s regional cooperation in energy networks, gas and electricity, has been modest until now. The region in spite of its resources and wealth was not able to develop the intensive regional energy networks that are common in Europe and North America. This is due to the long distances involved, large areas of desert, and also limited regional demand. As important have been regional political rivalries and disputes over borders and transit issues.

In the case of gas networks there are two significant regional networks, the Arab Gas Pipeline (Egypt, Jordan and Syria) and Dolphin pipeline (Qatar, UAE and Oman). Technically and economically the Dolphin pipeline should have been extended to Kuwait and Bahrain to provide low cost gas to these two countries, however disputes about crossing national borders and waters have till now prevented this, with the result that a country like Kuwait had to import Russian LNG while abundant cheap Qatari gas is available next door. Also the performance of the AGP has been most disappointing due to shortages in the availability of gas from Egypt which is requiring some MENA countries to rely on LNG imports (some-times from remote sources) while regional gas is abundant and cheap.

The same applies to the development of regional electricity networking and interconnections. Two regional networks have already been developed. The first involves countries along the Mediterranean coast (Egypt, Jordan, and Syria) with a weaker link to North African countries. The second development took part in stages to interconnect GCC countries. A first stage in 2009 linked Bahrain, Saudi Arabia Kuwait and Qatar, with the UAE joining in 2011 and Oman hopefully in 2013. This important network stretches across the Eastern Arabian Peninsula along the Gulf. It is still suffering from some teething and regulatory problems, as well as technical limitations, which will hopefully be overcome with more experience in managing such regional networks.

5.1. MENA oil and gas investments

MENA’s oil and gas investments have both a regional as well as a global dimension. Any significant shortages in the provision of needed investments to the sector will lead into global shortages in the oil supply and with implications to its price. Many MENA countries, realizing their limited technical potential and ability to finance and develop their oil resources, welcomed the participation of global energy companies to invest in developing their resources mostly through power sharing agreements (PSA) which vary from one country to another and also from one locality to another, depending on evaluated potentials, distances and similar considerations. However Saudi Arabia, which has in ARAMCO a giant oil company, and Kuwait, due to local political considerations, preferred to leave investment and development of their oil and gas resources to their national oil companies (NOCs) which usually hire local and foreign expertise and knowhow and mobilise mainly governmental funds to finance their development projects and expansion. Therefore the price of oil is crucial in this regard. As long as this price is at a margin of around $100 or above per barrel, these countries will be able, through income from oil exports, to finance their budgets and allocate the necessary sums for the maintenance and expansion of their upstream oil and gas production potential.
Saudi based APICORP (Aissaoui, 2012) annually assesses the requirements for energy investment in the MENA region including Iran. Their most recent assessment is that MENA energy investment requirements over the five year period 2013–2017, including that of the power sector, amount to $740 billion, made up approximately as follows:

- Oil upstream and mid-stream $95 billion.
- Gas upstream and mid-stream $160 billion.
- Oil and gas based downstream (refining, petrochemicals, fertilizers, LNG and GTL) $235 billion.
- The power sector $250 billion.

Saudi Arabia on its own is projected to invest $165 billion in the energy sector (ARAMCO, SABIC and affiliates, Saudi Electricity Company) over these five years. It will be followed by the UAE at $107 billion, Algeria $71 billion and Iraq $56 billion. Iran, with tighter international sanctions, is projected to invest tentatively only $68 billion, in spite of its huge potentials. Egypt, Libya, Yemen and Syria which have suffered a lot of local instability recently are most likely to have cautious involvement in their energy sectors by foreign companies as these are taking the attitude of wait and see.

The capital intensive electricity generation projects are increasingly attracting foreign/local private investments through independent power projects (IPPs) financing. However upstream and midstream oil and gas projects depend mostly on local funding through retained corporate earnings or state budget allocations. Downstream projects are financed by a mixture of increasing debt and equity. The present debt-equity ratio is projected to be 65:35, but differs from one project to another depending on its risk and expected availability of feedstock in the form of gas.

The projected availability of investment funds depends to a great extent on the projected income of oil and gas exports. If oil prices continue with the present average of $100 per barrel and slightly increase in the future to cater for inflation and also with slight increase in exports, then the present bottle-neck in securing investment funds to the sector will be eased. It has to be realized, as stated above, that the continued availability of oil and gas exports from the MENA region and needed upstream investments are not only of local importance but also of global interest.

## 6. Conclusions

The MENA region, as a whole, is the world’s richest in oil and gas proven reserves. Its resources, some of which are still to be discovered (including shale oil and shale gas which have scarcely been considered up to now), will allow it to continue to play a major role in the global energy scene for decades to come. Exports of oil have provided income, of varying levels, to practically all countries in the region, even those with limited or no energy resources. However the region’s oil resources’ wealth was a major factor in outside political interference, wars and political instability.

Wealth in resources promoted subsidies and energy overuse in most MENA countries, which is affecting their export potential. In spite of tremendous recent achievements in education and human development indicators, the entrenchment of rental practices has not encouraged productivity. Attainment of sustainable human potential and self reliance is a major challenge facing practically all countries of MENA. The other challenge is to provide representative and stable governments that promote stability to the region, and discourage outside interference so as to enable it to utilize its resource wealth more rationally.

## References

Dargain, J., 2012. MEES.
Middle East Economic Survey (MEES), 2013.