

Mothers of invention
Middle East Energy
and Resources:
Managing scarcity
for the future



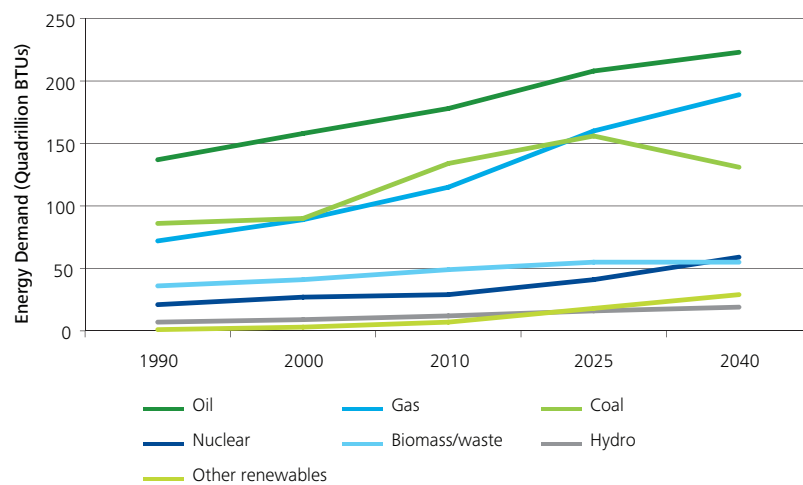
The role of National Oil Companies in promoting Technology Research and Development

Setting the scene: Energy demand and the “Technology” effect

Despite the increasing viability of renewable and alternative forms of energy, we cannot forget about oil and gas in a time when we are witnessing an unprecedented acceleration of energy demand. As alternative forms of energy increasingly make a case for long-term sustainable energy, the economic reality of today and the recent past dictates that oil and gas are still seen as the main sources of energy. As a result, we see that over the coming decades, demand and supply of oil and gas is forecast to continue to rise. Moreover, oil and gas will supply about 60 percent of global energy demand in 2040, up from 55 percent in 2010.¹

Energy sources are forecast to continue to evolve and diversify as global energy demand rises. Significant advancements in technology will cause natural gas to overtake coal as the number two fuel source. Indeed, we are already seeing a rapid rise in potential gas reserves through the shale gas revolution and most National Oil Companies (NOCs) in the Middle East have multi-billion dollar investment plans for gas exploration and production. Oil is still projected to remain the primary fuel. However, alternative sources such as nuclear, wind, solar and biofuel will take on an increasingly significant role in meeting the world’s energy needs in the future.²

World Energy Demand Forecast



Source: Exxon Mobil Outlook for Energy and Deloitte Analysis

Technology is vital in increasing oil and gas supplies, and production efficiency, as well as mitigating the environmental impact of energy production and consumption. Unaligned government regulations and uneven distribution of oil and gas sources and technological expertise around the world will result in more diversified operations, mergers, acquisitions and strategic partnerships. NOCs will need to develop, deploy and assimilate both their planned production and information technologies to enhance critical success factors such as operational excellence, performance management, enterprise risk management, people management and adaptive business models.

Motivation to foster new technology

Since the beginning of petroleum production, research and development has been the key to increasing recoverable reserves. Other than the economic benefits of fostering new technology, NOCs in the region are motivated by a number of other factors. With the region’s NOCs looking to continuously diversify across the value chain to transform into fully integrated energy companies, there is an increasing need for specialist skills. These skills have traditionally been brought in from abroad and through International Oil Companies (IOCs). Nevertheless, in recent years we have seen the creation of specialist research and training centers across the region to somewhat counter this importing of skills.

These centers are not only developing local talent but are also enabling research into new innovative areas. For example, students of the UAE's Al Hosn University recently developed a computerized fuel distribution model for Abu Dhabi National Oil Companies (ADNOC) which optimizes supply and service operations while minimizing environmental impact. If implemented, the system will help raise ADNOC's profits by increasing petroleum quantities and reducing the distances traveled by the company's distribution trucks.³

The environmental impact of oil production and consumption is a growing issue which NOCs are keen on tackling through innovative R&D methodologies. For example, Saudi Aramco is currently conducting a number of environmental studies in wasteland reclamation, biodegradation of hydrocarbon wastes, and even the development of microorganism technology to remove impurities in oil fields.⁴ Kuwait Petroleum Corporation (KPC) Energy Ventures, through an active investment program, is aiming to promote and influence the development of new technologies that make oil more efficient and environmentally-friendly. The NOCs clearly see sustainability and environmental impact as key facets of the oil and gas business, and have invested heavily in these areas.⁵

Recognizing these benefits, major NOCs in the Middle East have set up oil and gas research institutions (or are in the process of doing so). ADNOC's Petroleum Institute offers engineering education and research in areas of significance to the oil, gas and broader energy industry. ADNOC also runs a number of research and technical training centers, including the Takreer Research Center and Borouge's Ruwais Training Center, which began construction in February 2012. Kuwait Oil Company has recently embarked on a feasibility study for establishing a research center for the Kuwaiti oil sector, the main

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task of which would be to provide research services in the fields of exploration, production, refining, manufacturing, and raising the technical and environmental standards of the oil sector. Saudi Aramco's well-established Research and Development Center conducts research and development into surface upstream and downstream operations, with a focus on developing new technologies.

Challenges in maximizing the impact of R&D

Even though there are significantly large gains to be made through investing in R&D (both financially and from a domestic talent perspective), there are still a number of challenges which NOCs face in harnessing technology through R&D. A lack of portfolio management can lead to projects not being managed effectively. Projects may not be linked to the company's overall business strategy and goals. Most commonly, perhaps, inefficient allocation of resources and the absence of a clear integrated plan may lead to the benefits of R&D not being fully maximized. With research institutions still very much in the development phase, NOCs will continually look to mitigate the risk of these areas through effective management. It is also evident that R&D is playing an increasingly significant role in the long-term strategy of NOCs.

The Middle East oil and gas sector, and indeed the energy sector in general, also face the serious issue of skills shortages. This is a global problem but even more so in the Middle East where students across the region are choosing to pursue business careers outside of technology, physical sciences and technical process industries. These trends are stimulating high demand for a powerful combination of technology and talent in the Middle East. The restructuring of the existing talent pool, with preference for local hires rather than expensive expatriates, is yet another obstacle to bringing in the required skills in the short run. While at times bureaucratic and insensitive to individual organizations, this is fundamentally the right approach as it is unsustainable in the long- or even medium- term to have key R&D functions in the industry being carried out by transient expatriate industry specialists and researchers. And yet, until these roles are capable of being filled by properly trained, well-motivated nationals, the current situation, under which the Middle East oil and gas industry is restricted by talent shortages in other parts of the world, will continue.

In addition to skills shortages, substantial organizational change across the major NOCs, in the form of human resources transformation, strategic change and

workforce planning among other areas, is leading to further delays in the decision-making process and project approvals.

R&D centers may also face significant challenges from political instability in the region, which may result in domestic strategies shifting and government funding being swayed to other areas as national security and other domains take priority. Hence, Middle East oil and gas markets may remain volatile for the foreseeable future.

Changing realities of the Oil and Gas business

Technology development shifts to accommodate the ever-fluctuating realities of the oil and gas industry. The industry is now more and more intensely driven by information technology. With the rapid growth in domestic energy demand, oil and gas companies are looking to develop technologies to produce unconventional resources and also enhance recovery.

Even though research targeting unconventional and enhanced recovery can take years to develop, and investment is usually driven away from such longer term projects to those that yield more immediate results, there is strong evidence to suggest the region is indeed planning for the long term. One such example would be Abu Dhabi Gas Development Company (commonly known as Al Hosn Gas), which is in the process of developing the largest sour gas processing plant in the world. Such pressure to shift investment towards unconventional resources will continue to intensify as conventional resources diminish. However, this does not lessen the critical importance of conventional exploration and production, which very much remains the bread and butter of NOCs in the region.

NOCs are also producing oil and gas resources more cautiously than they did in the past. As a consequence, the focus is increasingly on more difficult and unconventional exploration opportunities, as well as the acquisition and development of advanced recovery technologies.

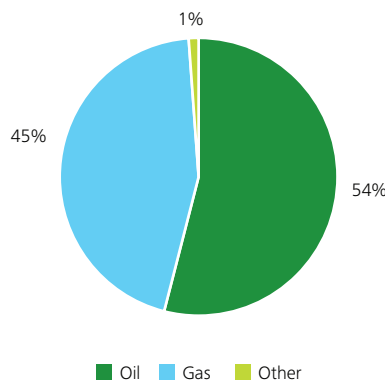
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Rising energy demand is a key driver in the volatile oil and gas industry, and with that in mind, the Gulf states, particularly the UAE, Qatar and Saudi Arabia, plan to award contracts worth over US\$68 billion during the next five years to raise gas production. A prime example of this is the US\$10 billion Shah field gas development project in Abu Dhabi, which is being managed and operated by an ADNOC subsidiary, Al Hosn Gas, with Occidental Petroleum as an international partner.

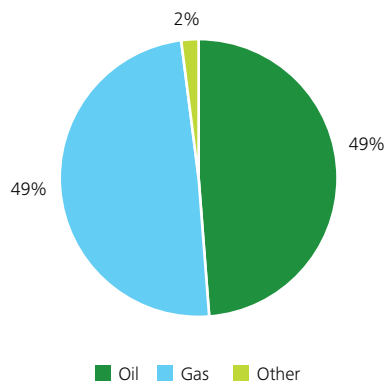
Gas will continue to play an increasingly significant role in the energy fuel mix over the next 30 years as technological advancements help extract, develop and process gas more effectively and efficiently. By 2025, natural gas will have overtaken coal as the second most consumed fuel, after oil. In the Middle East, gas will overtake oil in demand after 2025, with 50% of all energy demand coming from gas in 2040.⁶

With the nature of oil and gas production diversifying, strategies shifting to the unconventional, and an unprecedented rise of energy demand globally, R&D in the industry will play a crucial role in the longevity of the industry, no more so than in the Middle East where capacity building in local knowledge capital is critical to the development of the socio-economic fabric of the region.

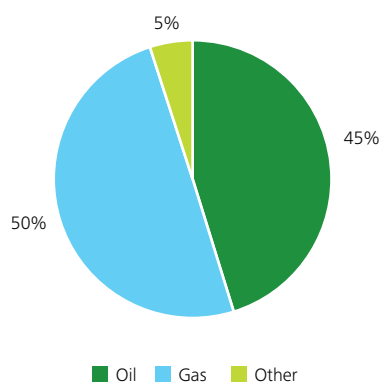
2010 Energy Demand Mix (Middle East)



2025 Energy Demand Mix (Middle East)



2040 Energy Demand Mix (Middle East)



Source: ExxonMobil

Endnotes

- 1 Exxon Mobil, "The Outlook for Energy: A View to 2040" (2013), pg 37
- 2 Exxon Mobil, "The Outlook for Energy: A View to 2040" (2013), pg 36
- 3 Al Hosn University website. <http://alhosnu.ae/WS/Site/News/NewsItem.aspx?nid=3384cdc2-0603-44c2-bf39-01677d95318d>
- 4 Saudi Aramco website. <http://www.saudiaramco.com/en/home/innovation2/centers-of-research/research-and-development-center.html>
- 5 KPC Energy Ventures "A Focus on New Energy Technologies". <http://www.kpc.com.kw/newscontent/images/pdf/KPC%20Energy%20Ventures%20Inc.pdf>
- 6 Exxon Mobil Energy Outlook to 2040 http://www.exxonmobil.com/Corporate/energy_outlook_sup.aspx

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