

The domestic challenges in the Saudi energy market and their regional and geopolitical implications

By Eckart Woertz

■ Executive summary

Saudi Arabia's domestic energy consumption is skyrocketing. The growth of electricity demand is particularly strong and shows a high degree of seasonality due to the need for air conditioning in the hot summer months. Demand drivers are population growth, industrial development and a subsidy regime that encourages wasteful consumption. Saudi Arabia now faces a natural gas shortage and is seeking alternative energy sources like nuclear power and renewables in order to reduce the common practice of using fuel oil, crude oil and diesel in power stations. If unchecked, domestic energy demand will threaten oil export capacity and could compromise Saudi Arabia's role as swing producer in global oil markets. However, a reform of the subsidy regime is politically sensitive, because citizens regard subsidies as an entitlement. The government is reluctant to touch subsidies in order to avoid the kind of political unrest that has occurred elsewhere in the wake of the Arab Spring.

Saudi Arabia's energy mix and demand drivers

Saudi Arabia's domestic energy consumption currently relies exclusively on oil and natural gas. Oil contributed 130 million tons oil equivalent (mtoe) and natural gas 93 mtoe in 2012 (BP, 2013). Apart from Kuwait, Saudi Arabia's dominant reliance on oil constitutes is an outlier in the Gulf region. In other states like Iran, the United Arab Emirates (UAE) and Qatar the majority of energy supplies still come from natural gas.

Like in other developing countries, electricity demand growth in Saudi Arabia is above gross domestic product (GDP) growth and at 8% is particularly high. Because of air-conditioning needs, electricity demand in the summer is around 40% higher than in the winter. Base-load and peak-load demand differ widely between day and night. As a result, total installed power capacity needs to be considerably above base-load requirements.

A growing population with increasing energy demand per capita as a result of economic growth and more varied consumption patterns drives demand. With an estimated GDP growth of 4.4% over the next five years, Saudi Arabia's real GDP growth is higher than in developed countries, but

lower than in many emerging markets. A high-input high-output model characterises the country's economy. Energy intensity per GDP unit is more than double that of European members of the Organisation for Economic Co-operation and Development. This gap is expected to grow until 2030.

The United Nations estimates that the Saudi population will grow from 28 million in 2010 to 45 million in 2050 and will then peak by 2065. Saudi Arabia is experiencing a demographic transition. As a result of urbanisation, the trend towards nuclear families and increased female education, birth rates have come down, like elsewhere in the world. The number of children per woman (the total fertility rate) will average 2.6 in 2010-15 and will fall below the replacement level of 2.1 in 2025-30 (UN, 2010).

Saudi Arabia has practically no public transport. Demand for car fuel is high because of the geographical vastness of the country and an extensive subsidy regime. Oil consumption is growing by 3.9% per year. Saudi Arabia is the world's sixth-largest oil consumer and already consumes a quarter of its own production of crude oil and natural gas liquids (BP, 2013). In 2010 it spent over \$30 billion on oil and about

\$12 billion on electricity subsidies. Its fossil fuel subsidies thus are the second largest in the world after Iran and larger than those of Russia, India and China, which follow it in the ranking (IEA, 2011).

Natural gas shortage

Saudi Arabia started to develop its natural gas reserves in the 1970s with its Master Gas Plan. The goal was to reduce gas flaring and make the country's large quantities of associated gas available for economic development. Concomitantly, a petrochemical industry was developed that currently has a world market share of more than 10%.

Saudi Arabia now faces a natural gas shortage. Petrochemical giant Saudi Basic Industries Corporation has regularly complained that it cannot get enough natural gas from national oil company Saudi Aramco. Petrochemical expansion has shifted from natural gas/ethane-based feedstock to naphtha/oil-based feedstock and is intertwined with the construction of deep-conversion refineries like Aramco's Petrorabigh joint venture with the Japanese company Sumitomo. Apart from the feedstock issue, naphtha-based production also yields higher value-added products and represents a natural development towards more sophisticated Saudi petrochemical production.

As a result of the natural gas shortage, fuel oil, diesel or even crude oil is used to fire new power plants and industrial projects. Half of all electricity production now comes from oil. Contrary to the 1980s and 1990s, when oil prices were low and there was a large oil glut, such a strategy now comes with high opportunity costs, because oil would fetch a good price on world markets. Apart from opportunity costs, the development of new capacities also comes with real costs, as it no longer suffices to simply open the spigots. With the development of deep-conversion refineries in the Gulf, less fuel oil will also be available for power plants, because more valuable items will be produced like gasoline and diesel.

The head of Saudi Aramco, Khalid al-Falih, warned in 2010 that even with production increases, Saudi Arabia's oil export capacity might be reduced by 3 million barrels per day in 2028 if skyrocketing domestic energy demand is not curtailed by more efficient usage. In a widely noted research report, Citigroup argued in 2012 that Saudi Arabia could turn into a net oil importer by 2030 if current demand growth patterns continue.

Geopolitical and regional implications

A reduction in oil export capacity would affect Saudi Arabia's budgetary position, which needed an oil price of \$83 dollars per barrel in 2013 to break even (IIF, 2013). Its current account surplus and its foreign asset position, which stood at \$750 billion at the end of 2013, would likely erode as a result and Saudi Arabia's ability to function as a swing producer in global oil markets would be diminished.

Recently it has used this position to counterbalance the decline in Iranian oil exports that resulted from a Western embargo in the wake of the nuclear standoff. The U.S. shale boom has led to downward pressures on oil prices and may have drawn attention away from Saudi Arabia's indispensable role as swing producer, but there is no alternative candidate in sight, with the possible exception of Iraq.

Iraq peddled plans in 2010 to increase oil production to 10-12 million barrels per day (mbpd) by 2017. Such dramatic increases are not likely, given the unstable situation in the country, but the Organisation of the Petroleum Exporting Countries (OPEC) aims to reintegrate Iraq into its quota system should the country's oil production move beyond 4-5 mbpd. This might be more easily accomplished in an environment of reduced export capacities of other OPEC members like Saudi Arabia, because it would not require a reduction of their quotas. On the other hand, Saudi Arabia might have an interest in increasing its production – and therefore its quota – in order to maintain its export revenues amid growing domestic consumption.

Policy responses

Managing domestic demand and finding new sources of energy supply are now high policy priorities in Saudi Arabia. Cutting subsidies and moving to a targeted subsidy regime of direct aid to needy segments of the population will be the most important issues. Officials like the minister of the economy and the head of the power utility company have started to raise these issues in public, but beyond this nothing has happened yet. As an authoritarian rentier state, Saudi Arabia's implicit social contract is no taxation and no representation. The regime buys acquiescence with welfare payments, subsidies and public sector jobs. It reiterated its part of the bargain when it increased spending in the wake of the Arab Spring to ward off spillover effects from other countries.

In this environment, reducing subsidies will be difficult. So far the debate has been led more from the supply side. Saudi Arabia is attempting to find new sources of energy supplies, which invariably will be more expensive to produce. This in turn will potentially increase the subsidy burden of the country if consumer prices should be maintained at current low levels.

Saudi Arabia does not intend to import natural gas like the UAE is already doing (via the Dolphin pipeline from Qatar and soon via a liquefied natural gas terminal in Fujairah; Kuwait also imports natural gas as liquefied natural gas). Neither does Saudi Arabia envisage coal-fired power plants, like the UAE and Oman have contemplated, or re-routing domestic gas destined for reinjection into mature oil fields to keep up reservoir pressure, like Abu Dhabi has done during hot summer months.

Apart from the current recourse to oil, the option is more production of natural gas, nuclear and solar energy. Prince Turki al-Faisal and the Saudi oil minister, 'Ali al-Naimi,

have recently given contradictory messages about a possible increase in Saudi oil production to 15 mbpd. In the absence of a substantial increase in oil production, unassociated natural gas would need to be found that is also independent of the ups and down in oil production and OPEC production decisions. Efforts to find new sources of natural gas in the Empty Quarter with foreign joint venture partners have not been successful so far, partly because controlled low domestic prices would make commercial production unviable. The development of unconventional shale gas resources, on the other hand, would be hampered by the lack of water in the country.

Saudi Arabia's nuclear programme is not as advanced as Iran's, which already has a civilian nuclear reactor at Buzher, or the UAE, which has started to build its first reactor, which is supposed to come on stream by 2017. Saudi Arabia hopes to have its first reactor operational by 2020 and wants to build 16 reactors until 2030, which would then cover 20% of its electricity needs. Yet a big question mark remains over this timetable amid safety issues, cost overruns and a lack of available experts. It is expected that Saudi Arabia, like the UAE, will refrain from enrichment activities and will not aim at mastering the full fuel cycle, as Iran is attempting to do, even though Saudi Arabian officials have hinted at the possibility of the country reacting to an Iranian nuclear weapons capability by acquiring a capability of its own.

In contrast to the UAE, Saudi Arabia has not yet signed a formal 123 agreement with the U.S. over nuclear co-operation, only a memorandum of understanding in 2008. The King 'Abdullah City for Atomic and Renewable Energy was established in 2010 to facilitate the expansion of these two new sources of Saudi Arabia's future energy mix. Oil Minister al-Naimi has argued that Saudi Arabia could export electricity produced from solar power instead of oil. So far such high-flying plans are far from realisation. Saudi

Arabia has only a paltry 12 MW of total installed solar capacity. The setback to the European Desertec project, which aimed to export concentrated solar power-based electricity from North Africa to Europe, has dented enthusiasm for such projects after two major German consortium partners, Siemens and Bosch, withdrew. Yet things in Saudi Arabia are set to change: the costs of photovoltaic cell panels have declined by over three-quarters over the last five years. Riyadh plans to install 41,000 MW of solar power capacity over the next 20 years.

Overland rail projects and a subway project for Riyadh might curb demand for fuel and add an urgently needed public sector transport component to mobility options. Another important area of energy policy will be efficiency gains in power generation (e.g. by introducing combined-cycle plants that combine water desalination and electricity production) and better insulation standards for buildings that could reduce residential energy demand. The sustainable satisfaction of Saudi Arabia's growing domestic energy needs will be an issue of high national importance and will have international ramifications over the coming decades.

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