



What is “our” oil doing in their economy? – Saudi oil consumption trends

Posted by [nate hagens](#) on April 8, 2011 - 9:39am

The following guest post is from Jonathan Callahan, a PhD chemist currently working as a data management / information access consultant. Jonathan writes on energy issues and data management at [Mazamascience.com](#).

Oil importing nations have long treated Saudi Arabia as an infinitely deep well of crude oil supplies. In 2005, Matt Simmon’s book [Twilight in the Desert](#) did much to call attention to the possibility of diminishing production from the desert kingdom’s aging wells. More recently, [cables released by Wikileaks](#) highlight the possible overstatement of Saudi oil reserves. Excellent commentary and links to detailed information covering these issues can be found in a [recent post on The Oil Drum](#).

What much of this discussion ignores, however, is that oil exports from Saudi Arabia depend on more than just production – they are a function of both production and internal consumption. This post will focus on the existing trends of energy *consumption* within Saudi Arabia and how they will impact future exports, whatever future production levels may be.

Long Term Trends

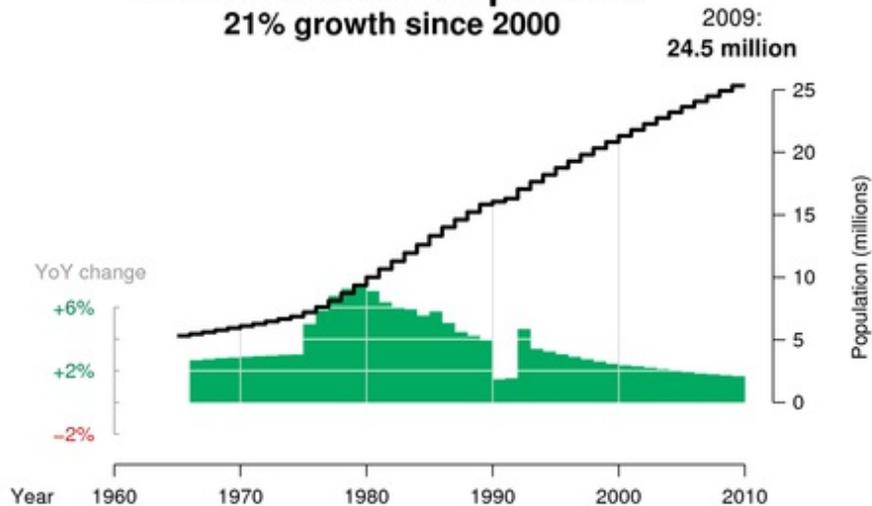
Consumption of energy within a nation is dependent upon the interplay of population, standard of living and energy efficiency of the economy. Of the three, only population can be measured and reported in simple, uncontroversial units: “# of persons”. It seems obvious but it bears stating explicitly that “In an industrial society, more people implies more energy.” This growth paradigm is of course the fundamental axiom of our current financial and economic systems.

Figure 1) from the [Gas Trends databrowser](#) shows Saudi Arabia’s rapid growth from a population of 5 million in 1965 to 25 million in 2010. The large influx of foreign workers seen in the late 70’s has been trending downward since 1980 with a large exodus seen in 1990-91 during the first Gulf War. Natural growth has slowed somewhat with total fertility rates dropping from 5.0 births per woman in 1995 to 2.9 births in 2005. Yet the population is still projected to reach 27 million in 2015 and 32 million in 2025.^[1] At that point the Saudi population will be larger than the combined populations of Australia and New Zealand.



Saudi Arabia – Population

21% growth since 2000



Data: US Census Bureau IDB Graphic: mazamascience.com

Figure 1) Saudi Arabia population

The effect this growing population is having on energy consumption is seen in the next two figures which come from the [Energy Export databrowser](#). In Figure 2) we see long term development of Saudi oil production (gray), internal consumption (black line) and net exports (green). While production levels over the last decade have seen some large year-to-year variations, production in recent years has been near the all time highs. By contrast, net exports in 2009 were at their lowest level since the first Gulf War. This is easily explained by looking at the steadily rising level of internal use which in 2009 consumed 27% of total oil production.

Saudi Arabia : Oil

2009 exports decreased by 16. %

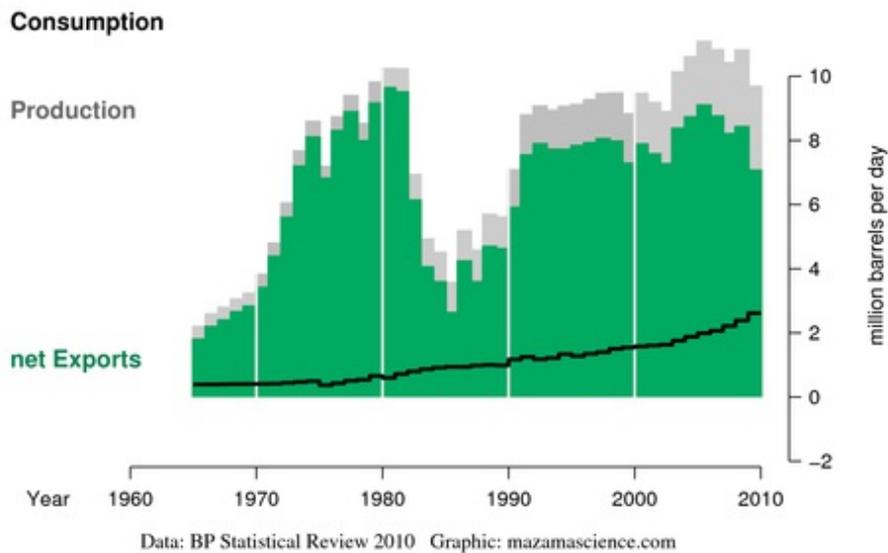


Figure 2) Saudi Arabia oil production, consumption and exports

The Energy Information Association (EIA) [Country Analysis Brief on Saudi Arabia](#) has the following to say about internal oil consumption trends:

Saudi Arabia is the largest oil consuming nation in the Middle East. In 2009, Saudi Arabia consumed approximately 2.4 million bbl/d of oil, up 50 percent since 2000, due to strong economic and industrial growth and subsidized prices. Contributing to this growth is rising direct burn of crude oil for power generation, which reaches 1 million bbl/d during summer months, and the use of natural gas liquids (NGLs) for petrochemical production. Khalid al-Falih, CEO of Saudi Aramco, warned that domestic liquids demand was on a pace to reach over 8 million bbl/d (oil equivalent) by 2030 if there were no improvements in energy efficiency and current trends continued.

Figure 3) shows the long term trend of Saudi Arabia's only other source of energy – natural gas. With no infrastructure for import/export of natural gas, the Kingdom consumes 100% of its own production. In 2008, natural gas accounted for 44% of total energy consumption with oil making up the rest.^[2]

Saudi Arabia : Nat. Gas

2009 imports increased by -- %

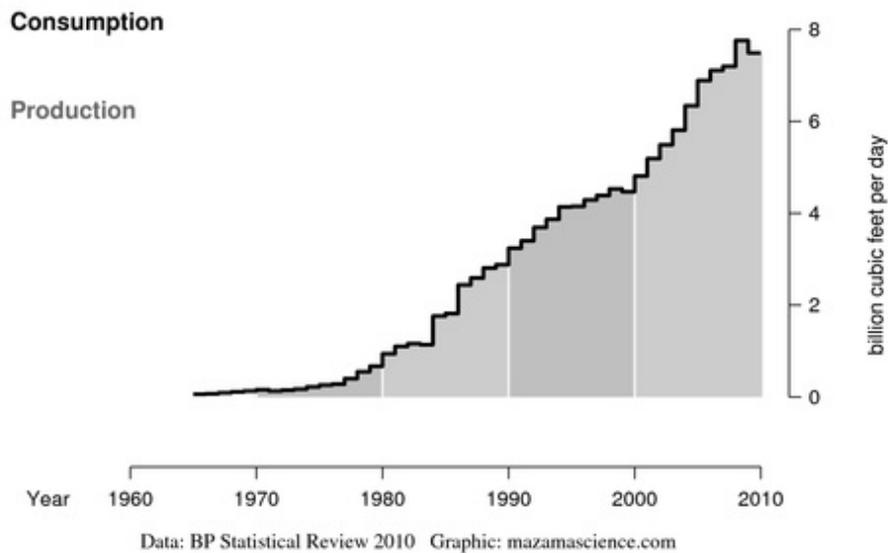


Figure 3) Saudi Arabia natural gas production and consumption

The rising level of consumption seen in figure 3) is expected to continue as explained in the same EIA Country Analysis Brief:

Rapid reserve development [of natural gas] is necessary for Saudi Arabia's plans to fuel the growth of the petrochemical sector, as well as for power generation and for water desalination. Saudi Arabia had set a goal of meeting 10 percent of global petrochemical demand by 2015, with natural gas a primary feedstock. According to Saudi Aramco forecasts, natural gas demand in the kingdom is expected to more than double to 14.5 billion cubic feet per day (Bcf/d) by 2030, up from an estimated 7.1 Bcf/d in 2007. In order to free up petroleum for export, all current and future gas supplies (except natural gas liquids) reportedly remain earmarked for use in domestic industrial consumption and desalination.

As figures 2) and 3) make clear, overall energy consumption trends are up significantly in recent decades and reflect the needs of a growing population and a growing economy. Even if we make the bold assumption that the current unrest in the Arab world leaves the Saudi political establishment unchanged for the next decade, rising energy consumption levels will greatly impact Saudi Arabia's ability to export at the level to which oil consuming nations have grown accustomed.

Recent Oil Consumption Trends

This section will review some of the more recent trends and projections in an attempt to identify more specifically how different segments of Saudi Arabia's industrializing society contribute to increased oil consumption.

Refineries

The [Joint Oil Data Initiative](#) (JODI) is an international effort to address the need for “transparency in oil market data”. Collecting data from producing and consuming nations, the [JODI database](#) attempts to provide “timely, comprehensive, and sustainable energy data” on a monthly basis. Although data reported by many nations are still unreliable, the data for Saudi Arabia are quite good. (JODI is headquartered in Riyadh.)

Figure 4) uses a chart from the [JODI databrowser](#) to show recent trends in refinery output (gray), local consumption (black line), exports (green) and imports (red) of refined products. (Similar charts are available for individual refinery products.) Looking at total refinery output, we can see a steady increase in demand of refined products along with an increasingly pronounced seasonal cycle. In the bottom half of the chart we see that what had been a comfortable cushion held in stocks has dwindled in the last two years to a two week buffer as demand begins to regularly exceed supply. Increased refinery output in January has temporarily allowed for a slight stock build.

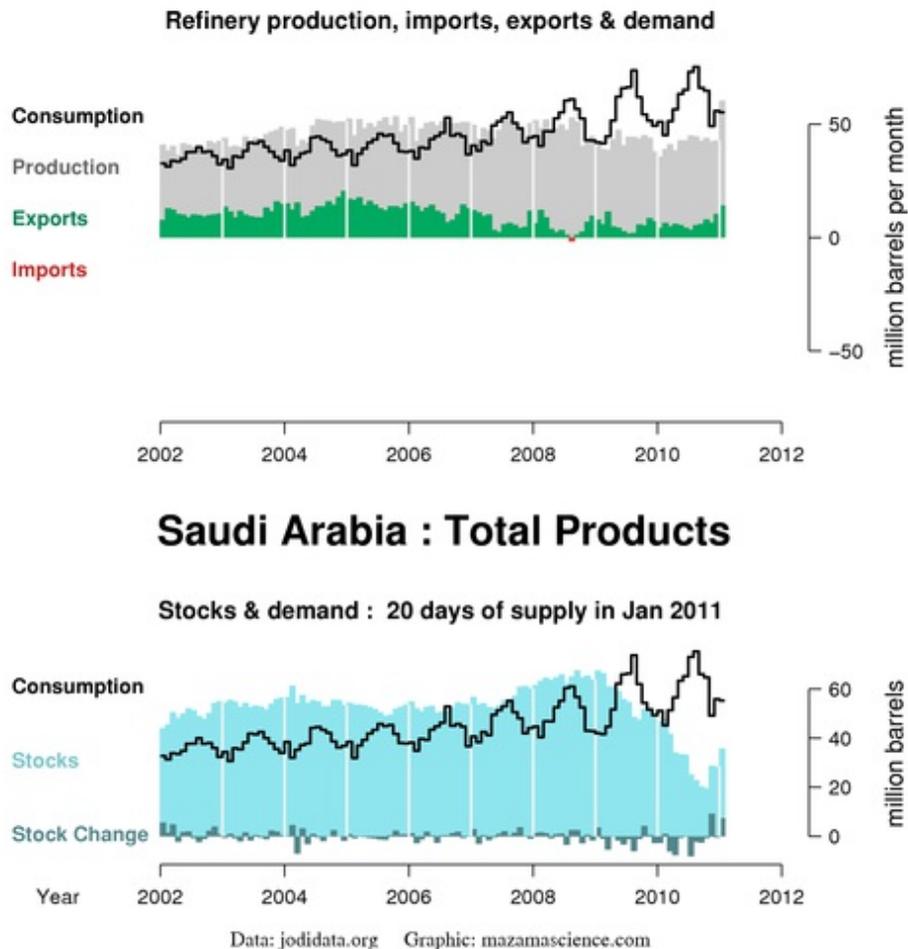
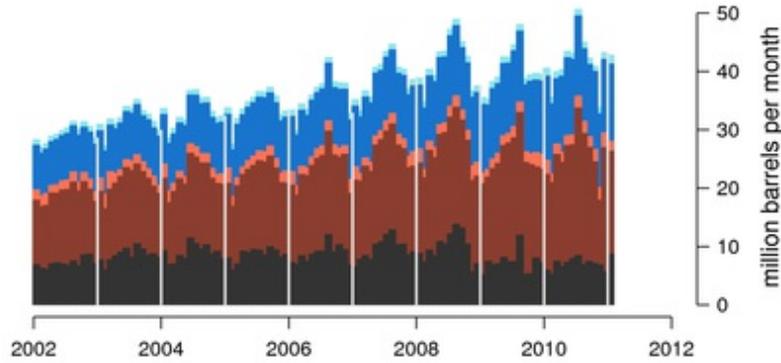
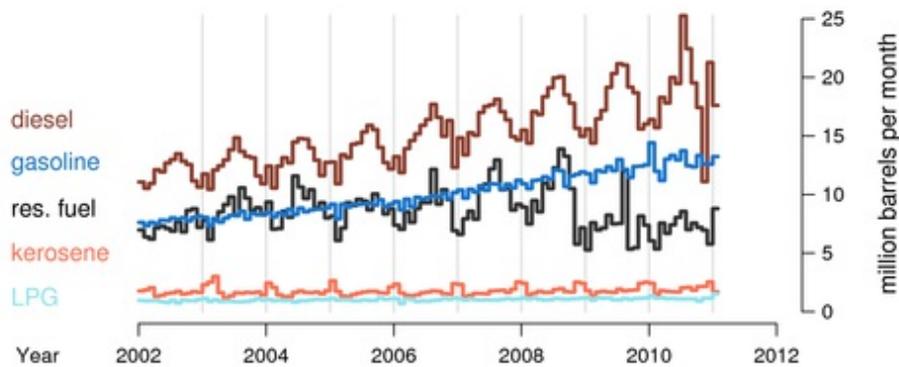


Figure 4) Saudi Arabia total refinery output, consumption and stocks

The consumption trends for individual components of refinery output is seen in figure 5). The most important liquid fuels in the Saudi economy are diesel and gasoline. Diesel (brown) is used primarily to provide electrical power^[3] with highest use during demand peaks in the summer cooling season. Fuel oil, crude and diesel run about half of Saudi Electricity Company’s plants, the rest being fueled by natural gas.^[4] Gasoline consumption (blue) shows a steady increase, driven by the [growing Saudi automotive market](#).



Saudi Arabia: Fuel Consumption



Data: jodidata.org Graphic: mazamascience.com

Figure 5) Saudi consumption of refined products.

These trends reflect in large part the rapid development of a broad Saudi consumer culture. It probably doesn't require a huge marketing campaign to encourage the average Saudi to install an air conditioner but it does seem ironic that the US government, through their buyusa.gov site, seems to be encouraging the sale of gas guzzlers to the Saudis. Here is a quote from their [Saudi auto market brief](#) [pdf].

The strength of the Saudi economy, reflected in a higher per capita income, led to the increasing popularity of luxury cars and premium automobiles. In addition, Saudis have always opted for large SUVs that can accommodate large families. The market for GMC Suburbans and similar sized SUVs has remained relatively unaffected by the fluctuations in the economy.

Desalination

Providing fresh water to Saudi's millions is a very high priority in their desert environment. To date, 27 desalination plants operate throughout the country, which provide 70% of the nation's potable water along with 28 thousand megawatts of electricity from Integrated Water and Power Plants (IWPP). Unfortunately, this currently requires burning approximately 1.5 million barrels per day of crude oil.^[5] The largest desalination plant in the world, [Shoaiba](#), currently runs on fuel oil. Despite encouraging news a year ago that [Saudis launch national solar desalination initiative](#),

initial efforts to produce 11 million m³/yr of water by 2013 pale in comparison to Shoaiba's output of 150 million m³/yr. And no one is waiting to see how well solar desalination works. The huge [Ras Azzour IWPP](#) is currently under construction and will provide 375 million m³/yr of fresh water along with 2400 MW of power — all fueled by crude oil.

Economy

Even before the current unrest in the Arab world, the Saudi government knew that it had to increase economic development to address the needs of their burgeoning population. The [Ministry of Economy and Planning](#) summarizes the basic road map in its [Brief on the Ninth Development Plan](#) [pdf], released in 2010, which identifies five major themes:

1. “enhancing and intensifying efforts to improve citizens’ standard of living and promote their quality of life”
2. “development of national manpower and increasing their employment”
3. “balanced development among regions of the Kingdom”
4. “structural development”
5. “raising the competitiveness of the national economy and national products”

The report goes into much more detail as to what each theme implies. Suffice it to say that achieving any of the goals will entail using more oil within the Saudi economy.

The other aspect of Saudi Arabia to be aware of is that rising oil prices, in contrast to their effect on importing nations, act as a boost to the Saudi economy. Despite the sensationalist title, the article [As the Middle East Burns, Saudi Economy Glows](#) accurately identifies what is currently going on:

Bahrain and Yemen aside, the turmoil in the Middle East has turned into a boon for Saudi Arabia, as the country's coffers swell with the proceeds of climbing oil prices and production. And, a series of subsidies and other measures worth as much as \$xx billion will help ensure the bounty reaches ordinary Saudis.

National Commercial Bank, a Saudi lender, raised its outlook this week to 5.1% from a previous 4%. Barclays Capital is planning to revise its forecasts shortly as is Bank of America. A Reuters poll of economists taken last week before the second of two government spending plans was unveiled showed the Saudi economy growing by 4.5% this year, slightly faster than previous expected.

As supplies from Libya have fallen and worries that other exporters may cut output as well, oil prices have risen about 20% this year. Benchmark Brent crude for May delivery traded at about \$115 for a barrel on Thursday. Economists estimate that for every \$10 increase in the price, Saudi Arabia can increase its budget by 6% of gross domestic product.

Conclusion

A few simple facts summarize the details explored above:

1. Saudi Arabia has a rapidly growing population.
2. The Saudis wish to grow their economy. (Who doesn't?)

3. Growing the Saudi economy will require a lot of energy.
4. Increasing oil prices stimulate the Saudi economy.
5. Oil is the only conventional energy supply Saudi Arabia has in surplus.

This article makes the case that the Saudi economy will consume ever increasing quantities of the oil they are currently exporting. The argument will be made that they could meet much of their power needs with either nuclear or solar power in order to continue earning oil export revenues. While enticing in theory, the real world of existing infrastructure, existing know-how, existing finance and existing technology will trump in the near term.

As for nuclear power, the current disaster in Japan will act as a drag on proposals to build nuclear reactors in the region. Even after any decision is made to proceed it will still take a decade for any nuclear power to come on-line as outlined in the article [Gulf presses ahead with nuclear energy](#):

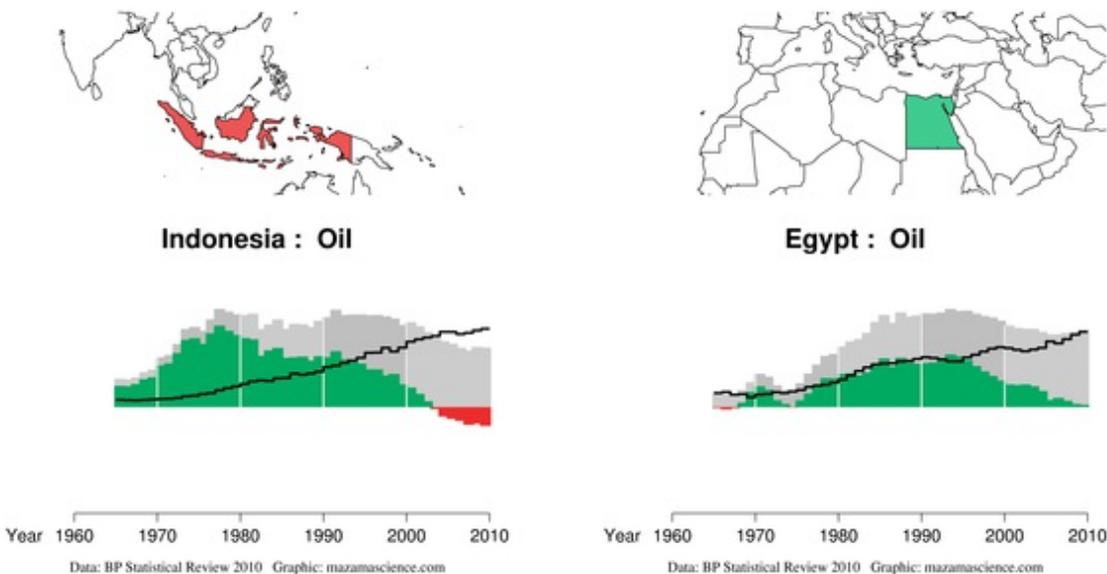
Saudi Arabia has signed nuclear co-operation agreements with the US and France, creating a ministry-level centre for the development of nuclear and renewable power.

“It’s at an early stage,” said Saleh Alawaji, the Saudi Arabian deputy minister for electricity and chairman of Saudi Electricity said at a utilities conference in Abu Dhabi yesterday. “I think the option of using nuclear energy ... is a must.”

Kuwait is considering up to six nuclear reactors, with the first two planned to come online in 2021 or 2022. Despite the widespread misgivings, Kuwait is likely to proceed with those plans, Ms Marafi said.

Solar power is a much more viable option and there are promising signs such as the [Saudi-SrR1.43bn deal for solar cell manufacturing plant](#). Unfortunately, the pace of adoption of solar does not meet Saudi Arabia’s immediate needs for power. That’s why we still see headlines like [Saudi to boost crude burn for power generation in 2011](#).

We should expect Saudi use of their oil patrimony to evolve very similarly to that of other growing, industrializing, oil endowed, Islamic nations as seen in figure 6):



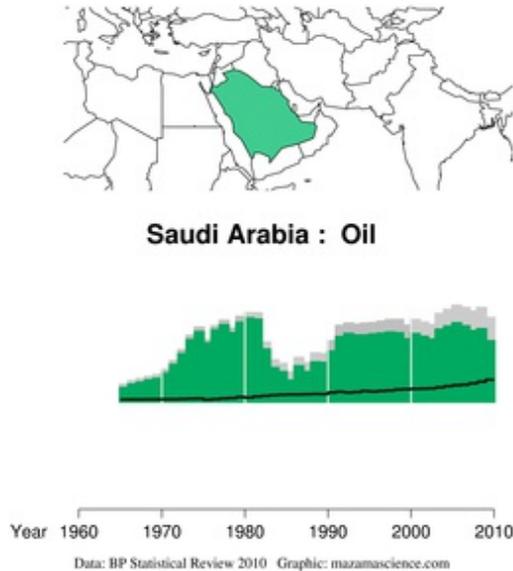


Figure 6) Oil net-export trends for Indonesia, Egypt and Saudi Arabia

Both Indonesia and Egypt have seen relatively moderate declines in their ability to produce oil. Yet they have been eliminated from the ranks of oil exporting nations because of rising internal consumption. Indonesia's net exports of oil have fallen steadily since their secondary peak production year in 1992. Egyptian net exports of oil have fallen steadily since their peak production year in 1993. So far, Saudi annual net exports of oil have fallen steadily since their peak production year in 2005.

Reviewing the population growth in figure 1) and all the evidence presented above it seems safe to predict that Saudi net exports of crude oil have entered terminal decline.

Let's repeat that just to make sure it doesn't get missed:

Saudi net-exports of crude oil have entered terminal decline.

Related Links

- [Saudi Arabia Looks to Solar, Nuclear Power to Reduce Its Oil Use by Half](#) (Bloomberg, Apr 3, 2011)
-
1. US Census Bureau [International Data Base](#) [↔]
 2. EIA [Country Analysis Brief on Saudi Arabia](#) [↔]
 3. [Saudi Power Sector Needs SAR300B Investment over 10 Years](#), Zawya, Mar 28, 2011 [↔]
 4. [Saudi Regulator May Hike Electricity Rates to Encourage Thriftier Usage](#), Bloomberg, Oct 04, 2010 [↔]
 5. [Saudi Arabia to Replace Oil with Sun Power for Desalination Plants](#), GLG news, Nov 15, 2010 [↔]



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