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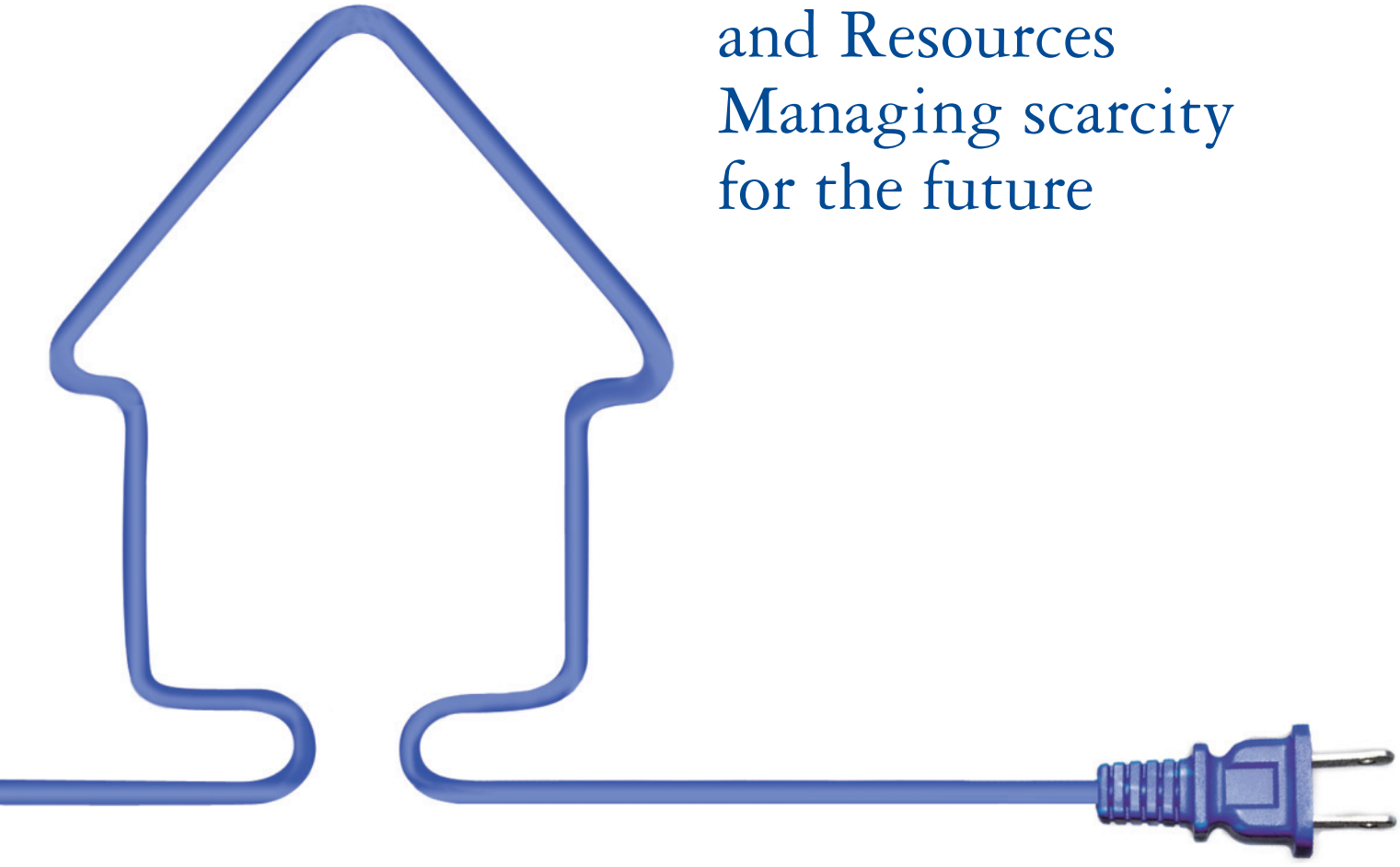
# Energy on demand: the future of GCC energy efficiency

## Middle East Energy and Resources

## Managing scarcity for the future



Eighty five years in the Middle East

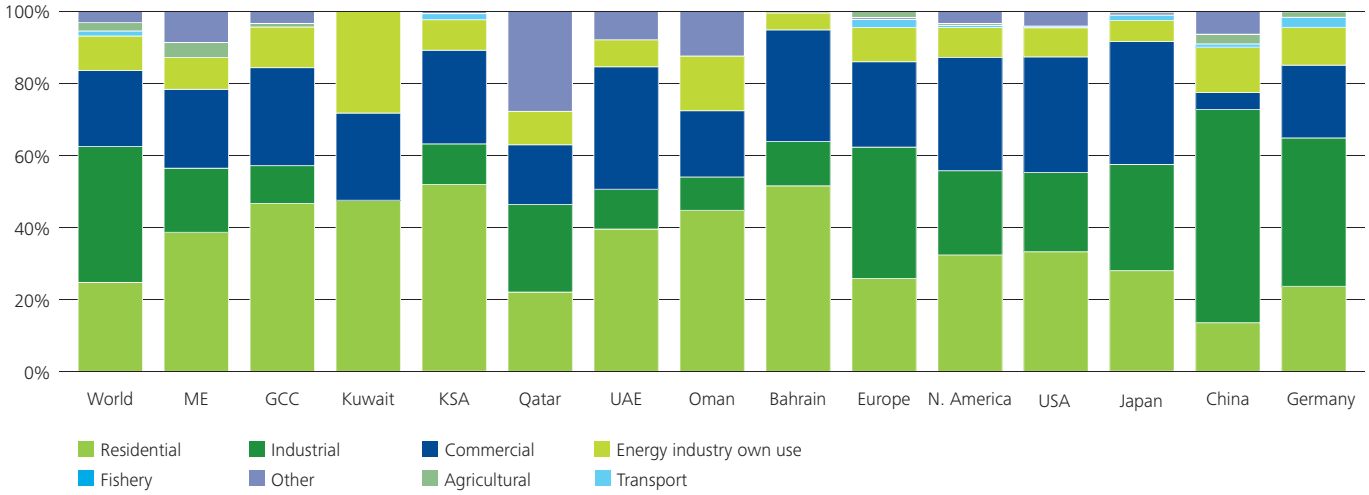
## GCC countries' consumption is driven largely by home use, with almost 47% of the energy consumption siphoned into residential use as compared to a global average of around 25%

'Energy Efficiency' revolves around reducing energy waste: this can be both on the demand side through power demand management and on the supply side using a host of technologies to improve efficiency in power generation and distribution. So how do the GCC countries stand in relation to these perspectives? Are there potential gains from using or producing energy more efficiently?

In 2008, each person in the GCC countries consumed on average 9.650 TWh of electricity against a global average of 2.782 TWh and a Middle East average of 3.384 Twh. This consumption appears more reasonable when compared to the Europeans, North Americans, and the Japanese who respectively consumed on average 6.285, 13.985 and 8.063 TWh of electricity during 2008: but, some might say, only apparently.

A further analysis of these consumption patterns, as shown in Table 1 below, reveals that the GCC countries' consumption is driven largely by home use, with almost 47% of the energy consumption siphoned into residential use when compared to a global average of around 25% and the most prolific of energy consumers, the Americans, consuming just over 33% of the total electricity supplied in the US in 2008 in their homes. In fact, head-to-head when absolute numbers are compared, each GCC resident is almost at par with the average consumer in the USA: both using more or less 4.5 TWh of electric energy in their respective homes in 2008.

**Energy consumption - GCC countries vs. selected regions**



What is worth noting here is that the per capita electricity demand in the GCC countries is expected to increase at a faster rate than their counterparts in the US. According to the '2010 International Energy Outlook' issued by the US Energy Information Administration (EIA), the per capita electricity consumption during the period 2007-2035 in the GCC is likely to increase at an annual rate of 2.5% , with a large part of this rate attributed to a growing population, as opposed to 0.8% in the US. So we can expect that in a matter of a few years, GCC residents may well be outright leaders in the per capita residential electricity use race.

Given this scenario, one would expect effective demand management to be part of the energy solution for the GCC countries. This is also evident with some forms of energy efficiency policies and measures being implemented in some of the GCC countries – but the measures may need to be streamlined and perhaps reassessed in some cases.

As a case in point, electricity is often provided to the residents at subsidized rates irrespective of the number of KWh of electricity consumed. Therefore, there is no incentive to reduce consumption based on the real price of electricity. Moreover, in some GCC countries, educational and awareness campaigns for more efficient use of electricity are directed at the end consumers without taking into account that the end consumer is often not liable to pay their electricity bill themselves: electricity is often included in the monthly rent. That is not quite the motivation one would expect for the end consumer to reduce electricity use.

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Some might say that the GCC countries are not industrialized or service based economies, and therefore it should be expected that residential use of electric power will be predominantly more than industrial or commercial use. The numbers most certainly support this view. In 2008, GCC countries put only 10.5% of their electricity to use in 'Industry' as opposed to 37.7% globally. The global energy super consumer, i.e. the US, put 22% percent of its electricity supplied to industrial use (the US has over the past two to three decades transitioned from an Industrial country to a 'Service Based Economy' with the commercial sector there consuming over 32% of the power supplied in 2008). Germany, the industrial heartland of Europe directed over 41% of its total electricity supply to its economic mainstay, just as the Newly Industrialized Country (NIC) of India did in 2008. China, the new manufacturing superpower of the world, puts most other industrialized countries to shame pouring almost 60% of the power supply into its gigantic industrial base.

Going by the electricity consumption patterns of the industrialized and industrializing countries, the success of an economic diversification strategy in the GCC countries may, among other efforts, require a shift in electricity consumption from 'Residential' to 'Industrial' use

But then again, conventional 'Industry' is certainly not the backbone of the GCC economies – their bread and butter is the production of fossil fuels. They have done well so far to exploit 'easy' oil and gas with GCC countries using on average 11.3% of their electricity supply, amounting in total to almost 40000 GWh of energy across the GCC countries in 2008 alone, to produce a colossal 13,001,860 GWh of energy equivalent in the form of fossil fuels (a large percentage of which is exported, of late at very high prices, to drive the GCC boom). This equates to a staggering 32,500% energy return on 'electric' energy invested as opposed to a global return of 8,000%. The North Americans of course no longer have the same easy oil fortunes of the past and only managed a return of just over 3,800% in 2008 which is forecast to reduce further in the near future as they've already, according to many experts, hit their 'Oil-Peak'.

The flipside is that the GCC economies may not be diversified enough to sustain their economies in the very long term: dependence on the oil and gas sector alone may not sustain these economies in the long term. According to one estimate, GCC countries should be able to support their economies with oil for about 80 odd years. In addition, and amongst other factors, the macro-economic scenario is complicated by the fact that the GCC countries are going through a population boom, with unemployment for the largest of the GCC countries hovering around 10%. There is, of course, a limit to the percentage of the labor force that can be employed in the Oil and Gas sector.

Recognizing these circumstances some of the GCC countries have embarked on economic diversification plans with industrialization a key component of the long term strategies they are pursuing. Going by the electricity consumption patterns of the industrialized and industrializing countries, the success of this strategy may, among other efforts, require a shift in electricity consumption from 'Residential' to 'Industrial' use. Thus residential electricity demand management certainly remains a key strategy tool that could be deployed by the GCC countries.

On the supply side, the construction and effective deployment of the GCC Interconnection Grid should take the GCC countries some way in optimizing the generation and transmission of electricity amongst the GCC countries thus potentially contributing to energy efficiency gains in transmission losses which hovered around the 10% mark in 2008 compared to the global average of 8.2%, and impressive averages of just 6.4% and 5.9% in Europe and North America respectively.

The numbers suggest that effective demand management of residential electricity could help the GCC countries solve some of their power sector dilemmas in the coming years. Not only will this help in reducing some of the demand for installing more generation capacity, but it will also divert some of the saved energy towards the industrialization or commercialization agendas of these countries. Particular note should be taken of the fact that it is also likely that the 'Energy Industry Own Use' of electric power is also likely to increase in the coming years as the 'Easy Oil' age for the GCC countries also draws closer as it has in the West. Making this shift a reality will require a rethink of the current energy policies (and implementation strategies) deployed by the GCC countries, after a thorough analysis of electricity consumption patterns, and in some cases a more detailed examination of supply side efficiencies.

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**Endnotes**

1 All figures have been derived through analysis of data obtained from the statistics site of the International Energy Agency, where the most current data available is that of 2008.

2 This figure could easily have been more than 50% had Qatar and UAE not classified 27.8% and 8% respectively of their electricity consumption in the 'Other' category. This category "covers residential, commercial and public services, agriculture/forestry, fishing and non-specified." The average 'Other' electricity consumption of the other four GCC countries combined is a mere 0.2% of their total energy consumed in 2008.

3 "U.S. electricity generation—including both generation by electric power producers and on-site generation—increases slowly, at an average annual rate of 0.8 percent from 2007 to 2035." (EIA: 2010 International Energy Outlook). By this token, it is assumed that electricity consumption is also likely to increase at the same rate. Similarly, according to the same source, "Electricity generation in the Middle East region grows by 2.5 percent per year in the same period. The region's young and rapidly growing population, along with a strong increase in national income, is expected to result in rapid growth in demand for electric power." Accordingly, it has been assumed that the residential use of electricity will grow at the rate of 2.5% annually in the GCC.

4 This figure is a rough estimate based on the annual average crude production of Saudi Arabia, Kuwait, UAE & Qatar (the major oil producers amongst the GCC countries) over the period 2001-2010 and proven reserves documented in the CIA World Factbook 2010. Forecast growth in production necessitated by ever increasing global demand has not been factored in the calculation.

5 This figure has been taken from the CIA's World Fact Book (https://www.cia.gov/library/publications/the-world-factbook/rankorder/2129rank.html). Other sources, (http://en.wikipedia.org/wiki/List_of_countries_by_unemployment_rate), puts this figure closer to 18% during some of the recent years.

6 Efficiency gains in transmission can be improved with the help of the GCC Interconnection grid assuming that some of the transmission losses are due to inefficient generation and transmission scheduling.